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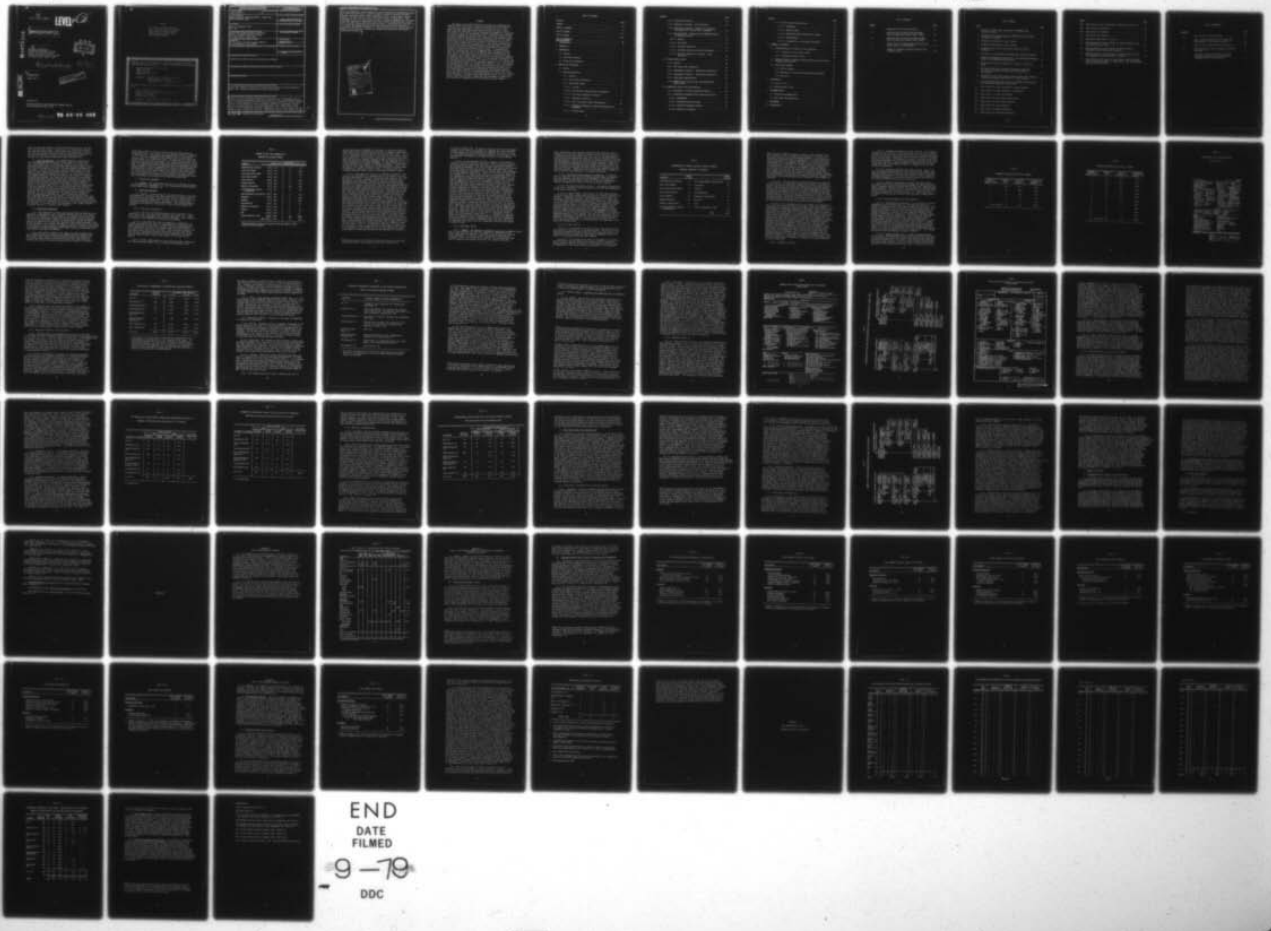

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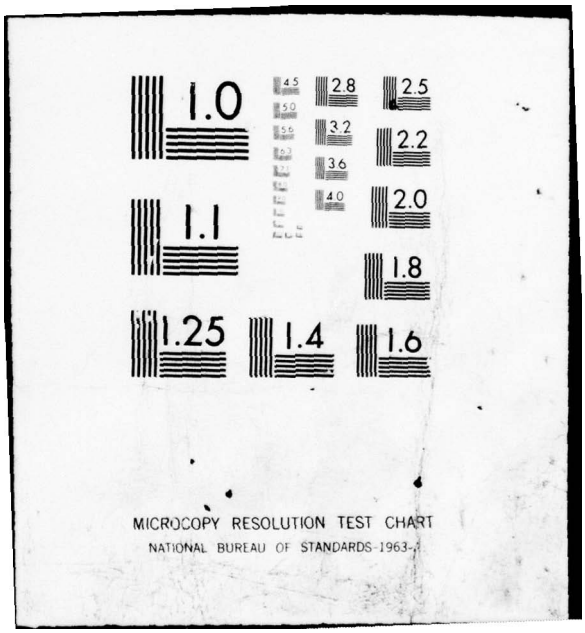
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

In response to the continuing shortage of physicians in the military, the US Army has recently developed a health care delivery system (the AMOSIST Program) which employs physician supervised enlisted corpsmen (AMOSISTs) in Acute Minor Illness Clinics (AMICs) to treat unappointed ambulatory outpatients through the use of printed manuals of medical algorithms. The present report (the third of four) presents the findings regarding the issues of the safety and the effectiveness of AMIC-delivered care. Safety-of-care was operationally defined as the extent to which the information recorded by AMOSISTs was consistent with

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20. the algorithms. Effectiveness-of-care was examined by comparing the data for AMIC-treated patients to that of patients treated in physician-staffed general outpatient clinics (GOC) regarding the rate of non-directed patient returns for care within 14 days of the date of their initial visit. The findings are that (a) errors among the data recorded by AMOSISTs were unacceptably high, and (b) no significant difference existed between patient return rates for AMIC-treated and GOC-treated patients. Recommendations were made to (a) revise and integrate the present data gathering and data utilization procedures employed by AMOSISTs, (b) formally increase local auditing requirements, and (c) provide a centralized, program-wide system for monitoring AMOSISTs' performance.

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SUMMARY

The safety and the effectiveness of patient care emanating from AMOSIST-staffed Acute Minor Illness Clinics (AMICs) was determined by evaluating and comparing the records of patients treated at three AMICs and three physician-staffed general outpatient clinics (GOCs). The safety with which AMIC care was delivered was assessed by evaluating the extent to which the information recorded by AMOSISTs was consistent with the algorithms provided for their use. The effectiveness of care delivered by AMICs was determined by comparing the data of AMIC-treated patients to that of GOC-treated patients regarding the rates at which these patients made non-directed returns for additional care within 14 days of their initial visit to the clinic. The findings indicate that the error rate evidenced by AMOSISTs was unacceptably high. The AMIC versus GOC comparison, however, yielded no statistically significant difference in non-directed patient return rates. In examining the program, it appears that (a) the inadequate local auditing procedures used, (b) the infrequent use of the AMOSIST Manual documented in the first report of this series and (c) the lack of a data collection and recording procedure which clearly depicts the logic employed by AMOSISTs in treating their patients, are likely to be the foremost contributors to the high error rates encountered. In view of the error rate observed and the non-documented status of the algorithms employed, it is asserted that the program is "at risk" from a medico-legal point of view. Accordingly, it was recommended that (a) existing local auditing requirements be increased and enforced, (b) the existing data gathering and data utilization procedures be replaced by an integrated, consolidated approach, (c) to the extent possible, existing algorithms be replaced with those which have been (or are to be) validated during the course of the research being conducted at the AMIC, Brooke Army Medical Center, and (d) a more active, centralized system of monitoring the performance of AMOSISTs at each facility be implemented within the Health Services Command.

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MAJ, MSC

1. INTRODUCTION.

1.1 This represents the third in a series of four reports on the "field" evaluation of the US Army's AMOSIST Program. A more complete description of the background to the study is presented in the initial report (Schopper, 1978a). The first report addressed the issues of the program's acceptance and its operational characteristics. The second evaluated the extent to which the program resulted in a savings of physicians' time and the cost effectiveness of the program (Schopper, 1978b). The fourth report will address the follow-up findings pertaining to the program's acceptance and operational characteristics.

1.2 Briefly, the AMOSIST Program is a relatively recently implemented US Army Program developed in response to the continuing physician shortage. It is a physician extender program which employs physician-supervised enlisted medical corpsmen who use written medical algorithms to provide care to ambulatory outpatients suffering acute minor illnesses. The present large scale study was initiated in response to a request from the Surgeon General, US Army following inquiries to him from the other armed services for information pertaining to the AMOSIST Program. A study protocol was developed and approved (Schopper, 1976) and data collection occurred during the period October 1976 through June 1977.

2. OBJECTIVE.

To determine the degree of safety and effectiveness with which care is delivered by the AMOSIST Program.

3. METHODOLOGY.

3.1 General. Within the context of the present study, the phrase "safety and effectiveness of care" is operationally delimited to two principal components. The safety component involves the determination of the extent to which the medical corpsmen employed in the AMOSIST Program, i.e., AMOSISTs, record their findings and treatment in accordance with the algorithms provided for their use. The medical effectiveness involves the comparative evaluation of the non-directed patient return rates evidenced by the Acute Minor Illness Clinics (AMICs) of the AMOSIST Program and those evidenced by the more traditional, physician-staffed, general outpatient clinics (GOCs). On-site visits of two weeks duration were made to three GOCs and three AMICs to collect the data required to address these issues. The three AMICs involved had been among 12 receiving on-site visits approximately six months prior to the time the data presently addressed were collected. The three selected were among those whose operations were judged to have been most efficient and in greatest accord with existing Health Services Command (HSC) guidelines. The three GOCs involved were selected primarily on the basis of the least degree of involvement by physician extenders in their operations, and secondarily upon the reported workload. This rationale was chosen in order to (a) select GOCs whose operations were most "traditional" (in that most patient care was physician-rendered) and (b) to maximize the

amount of data which could be collected during the course of each two-week data collection period. Each record of a patient visit selected for inclusion in the study was photocopied from the patient's record file with the patient's name and social security number being obliterated from the photocopy with black, felt-tip marking pens prior to placing it in the on-site study team's data collection file.

3.2 Algorithm Adherence. The AMOSIST Program, as described in HSC's Ambulatory Patient Care Model 13 (APC Model #13, 1976), indicates that AMOSISTs are to record their findings and treatment for each patient they treat on the preprinted data collection sheets (DSCs) which have been prepared for each of the eight general algorithms that they employ. For the present study, overlay transparencies were prepared for each diagnosis encountered for which there existed at least 5 DCSs which met the following two criteria: (a) that there was but one diagnosis rendered, and (b) that there was no evidence of physician consultation indicated. The reason for the exclusion of those single diagnosis DCSs which evidenced a physician's involvement is that from the information available on the DCSs there is no way to determine the extent or nature of the physician's involvement (a factor which is judged to be a significant deficit of the present data-recording system). Since some (unknown) portion of the consultations may have resulted in a logic overrule by the physician, there was no alternative but to exclude all DCSs which evidenced a physician consultation from the present analysis. For the present analyses, the sample of DCSs screened for these characteristics (AMOSIST-only, single diagnosis) included not only those DCSs obtained for the purpose of the retrospective audit, but also those DCSs from the medical records of patients treated in the AMICs during the period the study team was on site. The overlays were applied to all DCSs meeting the requirements and the errors found in each were recorded and analyzed. It is noted that the utilization of the "single diagnosis" criterion results in a "simplest case" analysis.

3.3 Return Rate Comparison.

3.3.1 The comparison of return rates between AMICs and GOCs was accomplished by a retrospective audit of medical records from two of the three AMICs and all three GOCs. The exclusion of the records from the third AMIC was due to the finding that during the interim between the initial Phase I site visits and the Phase II visits, the operation of the AMIC and medical practice of physicians and physician assistants (PAs) general medicine clinic became intermixed. As a result, the sample of records returned for the purpose of retrospective audit contained a substantial portion of records from non-AMIC care providers and DCSs evidencing consultations by PAs and physicians whose relationship to the AMIC was unknown.

3.3.2 The records included in the sample from each included clinic were randomly selected from those of the patients who had received treatment in the clinic during a three-week period beginning six weeks prior to the date of the arrival of the on-site study team. Upon arrival of the team, the records of these patients were first examined to determine

which entry related to the first visit to have occurred within the three-week period. The records were then examined further to determine if there had to be a succeeding, non-directed visit to the hospital (i.e., a visit not requested by the original care provider) within two calendar weeks of the aforecited visit. If there was, the entry appropriate to this visit was also copied. All records which had been copied were then returned to the study agency for further examination to determine, for those patients who had returned within the designated two-week period, whether or not the succeeding visit was an illness or medical condition which could be considered to be related to the initial visit. All return visits which were related to the initial visit were counted as a "criterion" return visit. The data obtained from these clinics were then evaluated to determine if there existed a statistically significant difference in the return rates evidenced between them.

4. RESULTS AND DISCUSSION.

4.1 General. The findings which pertain to the overlay evaluation are presented first (paragraph 4.2). The findings which relate patient-return rates follow (paragraph 4.3).

4.2 Algorithm Adherence.

4.2.1 General. In the process of selecting the DCSs for evaluation and subsequently evaluating those which were selected, several types of information were developed. Presented below are the findings which pertain to the following information: presence of vital signs on DCSs, asterisked physician consultation requirements, logic-related physician consultation requirements, utilization of DCSs, and non-required DCS entries.

4.2.2 Vital Signs Information.

4.2.2.1 One set of information required on all the DCSs is that pertaining to the recording of the patient's vital signs, i.e., temperature, pulse rate, respiration rate and blood pressure. Table 1 depicts the extent to which AMOSISTs did record such information.

4.2.2.2 It is clear that, with the exception of temperature recordings, the AMOSISTs did not do an acceptable job of recording vital signs information on their DCSs. On none of the 282 single-diagnosis DCSs evaluated was the pulse rate recorded, and on but two (0.7%) of them was the patient's respiration rate noted. Blood pressure recordings were made, on the average, for only one patient in every eight (12.6%). Even the most frequently recorded vital sign, temperature, was absent from the patient's DCS in nearly forty percent of the cases (39.1% absent).

4.2.2.3 Several observations are given regarding these findings and the pattern observed therein. First, as regards the apparently poor

Table 1

PRESENCE OF VITAL SIGNS INFORMATION ON

AMOSISTS DATA COLLECTION SHEETS

DIAGNOSIS	(# of Cases)	VITAL SIGN *			
		TEMPERATURE	PULSE	RESPIRATION	BLOOD PRESSURE
Conjunctivitis, bacterial	(8)	37.5	0	0	0
Acute Otitis Media	(16)	62.5	0	0	18.8
Acute Serous Otitis Media	(14)	35.7	0	0	21.4
Acute Otitis Externa	(8)	85.7	0	0	0
Acute Sinusitis	(10)	90.0	0	0	20.0
Allergic Rhinitis	(16)	69.2	0	0	23.1
Rhinitis, Non-specific	(9)	66.7	0	11.1	22.2
Acute Pharyngitis, possibly streptococcal	(17)	62.5	0	0	5.9
Acute Pharyngitis, Non-specific	(52)	60.0	0	0	17.3
Bronchitis	(20)	68.4	0	0	15.0
Headache	(7)	28.6	0	0	28.6
Gastroenteritis	(17)	73.3	0	0	0
Vaginitis, Non-specific	(16)	43.8	0	0	0
Cystitis	(40)	45.0	0	0	5.0
Acne	(13)	84.6	0	0	0
Contact Dermatitis, Plant	(19)	83.3	0	5.3	26.3
TOTAL	(282)	60.9	0	0.7	12.6

* Data are depicted in terms of the percent of the total number of cases evaluated for each diagnosis.

overall performance of AMOSISTs on this task, it might be offered, in their defense, that such information reflects a redundant requirement within the patient's medical records for that particular visit. It was, in fact, frequently the case that at least some of the patient's vital signs (temperature, blood pressure, and, often, pulse rate) were determined and recorded on either a separate SF 600 or Triage DCS prior to the time the patient saw the AMOSIST himself. In such instances, it is clearly duplicative to require the AMOSIST to transfer this information to the DCS that he will employ in treating the patient. Hence, the omission of vital signs information in such instances would not appear to constitute a cause for serious concern -- as long as such pre-treatment materials remain a part of the patient's medical records.

4.2.2.4 The caveat just cited is not employed as rhetoric. The status of the Triage DCS as a permanent part of the patient's record has been questionable in the past (as has been the status of the treatment DCS). It is only somewhat recently that this issue has been acknowledged and addressed. Whereas the guidance provided in HSC's APC Model #13 (Aug 76) indicates that both the triage and treatment DSCs are to be placed in the patient's records, such guidance conflicted with the more binding requirements provided in AR 40-400 and AR 40-403. Collectively, these regulations state that only Department of the Army (DA) forms may be included in patient records. Since both the triage data collection sheets and the treatment data collection sheets are locally reproduced forms, they could not be included in the records. However, a relatively recent interim change (March 1977) to these regulations now permits them to be included.* Nevertheless, based upon observations made during the course of the present study, it is clear that such guidance is not being uniformly adhered to. One principal objection which has been voiced to the inclusion of the Triage DCS in the medical records is the bulk it adds. In lieu of this form (a full size, one sided page), one site made entries on the SF 600 to record triage information and whatever vital signs which were routinely obtained. The difficulty observed with this alternative procedure is that this separate SF 600 entry was often separated from the treatment DCS employed for that visit by one or more pages. (In other words, SF 600 entries were made sequentially until both sides of the form had been filled, whereas a new treatment DCS was initiated for each visit. Hence, it was possible for several treatment DCSs to appear between the last employed DCS and the corresponding triage/vital signs note appropriate to same.) While it is acknowledged that such a practice does not constitute a breach of requirements, it does impose a small amount of inconvenience to the AMOSIST who must now leaf through the intervening pages to obtain such information and, hopefully, to transfer it

*The interim change to AR 40-400 has been incorporated into the newly published version of this regulation effective 1 October 1978.

to his own treatment DCS. The danger in such a practice (and the danger inherent in not routinely demanding that AMOSISTs make such transfers) is that during hours of peak workload, an AMOSIST may neglect to "look up" vital signs information to determine whether or not any one of them were abnormal (as defined by the ranges indicated in their AMOSIST manuals).

4.2.2.5 Of some additional interest, perhaps, is the pattern of omissions observed in the vital signs data. For all practical purposes, both pulse rate and respiration rate were ignored and blood pressure was recorded infrequently. Only the patients' temperatures were recorded with some degree of regularity (60.9%). While the reasons for these differences cannot be determined from the present study, there do appear to be some plausible speculations. First, it is noted that, aside from the "laundry-list" of symptoms and conditions that routinely appears at the beginning of each major algorithm within the AMOSIST Manual, it is only the patient's temperature which is occasionally alluded to in subsequent logic blocks for a few of the diagnoses. Hence, it is likely that the AMOSIST, by virtue of his continuing experience with the algorithms, perceives that information relating to pulse rate, respiration rate, and blood pressure will have much less impact upon the eventual diagnosis and treatment than will information regarding the patient's temperature. Therefore, the AMOSIST may pay more attention to (and record) this vital sign more so than the others. Another possibility, one which may act separately and in addition to that just cited, is that concerning the base rate with which deviations occur among the patient population. Whereas there is substantial latitude among healthy individuals regarding the range of values which may be considered "normal" for one's pulse rate, respiration rate, and blood pressure, the body's homeostatic mechanisms are such that (for the most part) regardless of an individual's sex, age, or degree of physical fitness, one's body temperature remains within a small stable range unless he is ill. While minor illness may have an impact upon an individual's pulse rate, respiration rate or blood pressure they are rarely driven beyond the rather wide range of values which is considered "normal." Hence, from this separate vantage point; i.e., independent of the frequency of occurrence within the algorithms, it is likely that AMOSISTs would more frequently derive information which would be of consequence to their work from a patient's temperature than they would from one of the remaining vital signs, and, as a consequence, they are more likely to attend to same.

4.2.3 Algorithmic Errors

4.2.3.1 General. The analysis of principal concern in the present evaluation is that performed upon the DCSs themselves to determine to what extent they have been completed in accordance with the guidance provided in the algorithms. As indicated within the approved study protocol (Schopper, 1975), this evaluation was confined to those DCSs which indicated no physician involvement and had but one diagnosis indicated.

These limitations, which clearly excluded the more difficult, multi-diagnosis cases from the analyses, derived from (a) the fact that once a physician countersigns a DCS, there is no way to determine whether a departure from the algorithm's logic was or was not directed by the consulting physician, and (b) the necessity of having to develop an individual DCS overlay transparency for each possible diagnosis. Among all of the 1909 AMOSIST-completed DCSs from two AMICs (and those meeting the cited criteria from the DCSs completed during the on-site visit to the AMIC for which the retrospective audit records were unusable) only 328 met these criteria. Among these, only 282 occurred with a frequency of five or more and were subjected to an overlay evaluation.

4.2.3.2 Distribution Among Diagnostic Categories. As shown in Table 2, these 282 cases were distribued unequally among 16 diagnosis. Only two diagnoses, non-specific Acute Pharyngitis, and Cystitis, occurred with a frequency greater than 30 (52 and 38, respectively). Clearly, the majority of them, 179 (63.5%), were URI illnesses.

4.2.3.3 Principal Categories of Errors. Two general categories of errors, Type A and Type B, were developed to facilitate the presentation of the error related data.

4.2.3.3.1 Type A Errors. Type A errors are those which pertain to the specially marked items (identified with an asterisk) appearing on each DCS. In general, the Type A, asterisked-entry errors relate to symptoms or conditions which are rather independent of the logic specific to any particular diagnosis addressed on a given DCS. The purpose of most of these items is to either (a) identify the conditions arising from past medical history or treatment which might interact with the symptoms/conditions which are now of most immediate concern to the patient in such a way as to escalate the danger of possible complications or demand medical sophistication in the development of a treatment plan that was beyond the capability of the AMOSIST, or (b) identify symptoms/conditions of such severity that they were beyond the scope of illnesses addressable by an AMOSIST. As such, the significance for an AMOSIST of the asterisk next to a DCS data entry point was to direct him to seek the consultation of a physician prior to formulating a diagnosis and treatment plan.

4.2.3.3.2 Type B Errors.

4.2.3.3.2.1 In contrast to the Type A errors, the Type B error is tied directly to the logic of the algorithm itself. Such an error indicates that an AMOSIST has made an incorrect DCS entry, one which is inconsistent with the decision-tree logic which is demanded in order to arrive at the diagnosis which has been rendered.

4.2.3.3.2.2 Also counted as an error (in consonance with guidance from the AMOSIST Section, Medicine and Surgery Division, Academy of Health Sciences, AHS) was the absence of any response (either positive of negative) for those items specifically addressed in the algorithm

Table 2

DISTRIBUTION OF SINGLE-DIAGNOSIS, AMOSIST-TREATED PATIENTS ACCORDING TO DIAGNOSIS

DIAGNOSIS	Number of Cases		Number of Cases
Conjunctivitis, bacterial	8	Acute Pharyngitis, Non-specific	52
Acute Otitis Media	16	Bronchitis	20
Acute Serous Otitis Media	14	Headache	7
Acute Otitis Externa	8	Gastroenteritis	17
Acute Sinusitis	10	Vaginitis, Non-specific	16
Allergic Rhinitis	16	Cystitis	38
Rhinitis, Non-specific	9	Acne	13
Acute Pharyngitis, possible streptococcal	17	Contact Dermatitis, Plant	19
		TOTAL	(282)

which required a negative response to arrive at the diagnosis cited. Not counted as an error, however, was the absence of an entry to a DCS entry position if the corresponding symptom or condition was not specifically addressed within the algorithm. In the strictest sense, this is contrary to the resident AHS instruction initially provided each AMOSIST since each AMOSIST is taught to make a written response (either positive or negative) to all DCS entry spaces. However, it was observed with some frequency that AMOSISTs would make entries only if they were positive and leave blank all negative findings. To have counted as errors all such absences of negative reports would have substantially inflated the number of errors encountered; therefore, as indicated above, the absence of a negative finding was counted as an error only if the algorithm specifically addressed a given symptom or condition.

4.2.3.3.2.3 Prior to ending the present introductory discussion of Type B errors, two additional comments are required. The first relates to the entry in the upper left-hand corner of all DCSs which pertains to the instructions provided to patients regarding the possible need for them to return to the clinic to obtain diagnostic test results of follow-up evaluations for care. Entries at this location were ignored during the course of the overlay evaluation unless the algorithm provided specific instructions regarding the patient's return. In these instances, however, the block was monitored not only to determine if it was appropriately checked, but also to see if the time period indicated was in accord with the instruction contained in the algorithm.

4.2.3.3.2.4 As a cautionary note to the reader, the labelling of Type A and Type B errors as such is not meant to imply the existence of a hierarchy of differential importance between them. While Type A errors (which pertain to asterisked entries and, therefore, directly relate to the absence of a needed physician involvement) might appear to assume a higher, more serious status, it is pointed out that Type B, logic-related errors reflect information or actions which were inconsistent with the algorithm and should have resulted, as a minimum, in a physician's consultation and might have resulted in either (a) an additional or different diagnosis than the one actually rendered or (b) a different treatment plan than that actually employed. The assertion of the need for a physician's involvement derives from the fact that treatment which is rendered solely by an AMOSIST must be limited to those specific conditions which are entirely compatible with the logic of the algorithm which yields those diagnoses. Since Type B errors indicate that the symptoms and/or the treatment were not in entire agreement with the algorithm appropriate to the diagnosis checked, the AMOSIST should have sought the counsel of a physician. Clearly, both types of errors, Types A and B, reflect errors of omission--the absence of a needed consultation with a physician.

4.2.3.4 Frequency of Errors.

4.2.3.4.1 Frequency distribution of Type A errors. The frequency distribution for all Type A, asterisked-entry errors is shown in Table 3. Clearly, for only about one in every four DCSs is it the case that there are no Type A errors. Conversely, nearly 37 percent (36.9%) of the DCSs had two or more Type A errors present. Overall, 73 percent of the DCSs had entries associated with these clearly marked data entry points that should have resulted in either an AMOSIST's consultation with a supervising physician or the complete transfer of responsibility for that patient to a physician.

4.2.3.4.2 Frequency distribution of Type B errors. Table 4 depicts the frequency distribution of Type B logic-related errors. The figures portrayed therein show that less than ten percent of the DCSs evaluated were totally free of this type of error. Only 13 percent of the sample possessed but a single error while slightly more than one-half (51.5%) evidenced three or more such errors.

4.2.3.4.3 Conjoint Consideration of Type A and Type B Errors. The figures cited in the two previous paragraphs and tables are the results of separate analyses performed upon the 282 cases comprising the sample evaluated. When these errors are considered in conjoint fashion, the overall result is that nearly all DCSs, 97.1 percent of them, evidenced at least one Type A or Type B error, i.e., only eight out of the sample of 282 cases were entirely free from both of these types of errors.

4.2.3.5 Type A and Type B Error Subcategories.

4.2.3.5.1 Subcategories Delineations. It is possible to further categorize the error-related data into two additional major subcategories: symptom-related errors and treatment-related errors. Both Type A, asterisked-entry errors and Type B, logic-related errors are possible within each. Each of these principal subcategories can be further categorized to reflect the same categories utilized by the AMOSIST in performing his examination, developing a treatment program, and deciding the patients disposition. These categories, symptom-related (subjective and objective) and treatment-plan-related (prescriptions, diagnostic tests requested, and disposition) are consistent with those which appear on the DCS itself, Figure 1. Among the treatment-plan-related subcategories, however, Type A errors are possible only with the prescription-related and disposition-related areas; i.e., there are no asterisked entries on the DCSs which are related to requests for disgnostic tests or consultations. The findings pertaining to each subcategory are shown in Table 5.

4.2.3.5.2 Symptom-Related Errors. Among the symptom-related errors, Type A, asterisked-entry errors occurred more than three times as often among the subjectively reported data than they did among the objectively observed data. The Type B, logic-related errors occurred with nearly equal frequency in both the subjective and objective subcategories of the symptom-related error data. As shown in the table,

Table 3

FREQUENCY DISTRIBUTION OF TYPE A ERRORS

NUMBER OF ERRORS PER DCS	NUMBER OF DCSs	RELATIVE FREQUENCY (%)	CUMMULATIVE FREQUENCY (%)
1	102	36.2	36.2
2	67	23.8	59.9
3	27	9.6	69.5
4	8	2.8	72.3
5	2	.7	73.0
0 (no errors)	76	27.0	100.0

Table 4

FREQUENCY DISTRIBUTION OF TYPE B ERRORS

NUMBER OF ERRORS PER DCS	NUMBER OF DCSs	RELATIVE FREQUENCY (%)	CUMMULATIVE FREQUENCY (%)
1	37	13.1	13.1
2	69	24.5	37.6
3	64	22.7	60.3
4	37	13.1	73.4
5	26	9.2	82.6
6	12	4.3	86.9
7	3	1.1	88.0
8	2	.7	88.7
9	-	-	88.7
10	2	.7	89.4
11	2	.7	90.1
0 (no errors)	28	9.9	100.0

Figure 1

RESPIRATORY DATA COLLECTION SHEET

(Reduced Size)

RESPIRATORY

CHIEF COMPLAINT(S):

SUBJECTIVE

__Chief complaint correct at Triage
*__Return visit for unchanged problem
*__Possibly pregnant
*__Taking MD ordered med:
#__Contraindicated med:
*__Shaking chills
*__Fev for mor thn 5d THROAT & NECK
*__Rash for les thn 5d __Pos TC in last 10d
EAR __Pos TC in fam now
__Tinnitus*__severe __Past rheum fever
__Vertigo*__severe __Sore throat for:
__Earache for: __Hoarseness for:
__Decreased hearing CHEST
__Ear itching *__Shortness of breath
NOSE & SINUS __Cough for:
__Nasal congestion __not improving
__Nasal drain__purul *__prod pur/bld sput
__recurrent/season __Chest pain__mild
__watery
__Itching eyes/nose OTHER
__Tearing __Headache for:
#__Sin xray in last 3mo*__Other:
__Runny nose for:

DATA

OBJECTIVE

DAY__ __MO__ __YR__ __ TIME IN__ __ __ __
TIME SEEN__ __ __ TIME OUT__ __ __ __
TEMP__ __ __.__ °F PULSE__ __ __b/m
RESP__ __b/m BP__ __ __/__ __ __/__ __ __
*__Abnormal VS *__Appears severely ill
EAR NOSE & SINUS
__Mastoid tend*__sev __Nasal drain__watery
__Ear drainage __purul*__act bleed
*__bloody __Nasal muc swol & red
__white-yellow *__Facial swelling
__TM not visible __Sinus tenderness
__can fil with wax THROAT & NECK
__TM loss of landmark __Red pharynx
__TM redness __Tonsillar exudate
__TM air fluid level *__Peritonsillar swell
__TM bubbles __Lymph nodes*__post
*__TM retracted __tender anterior
*__TM scar CHEST
*__TM perforated #*__Unequal brth sounds
__Canal tenderness #*__Rales rhon or wheez
__Canal swollen__red #__Chest point tender
__local*__pointing OTHER
__outer half #*__Decreas neck flex
__Ear fissures/scales*__Other:

ASSESSMENT

__Labyrinthitis __Ac Otitis Ext __Rhinitis, NOS __Laryngitis *__Other:
__Ac Otitis Media __Chr Otit Ext __Strep Sore Thr __Costochondritis
__Ac Ser Otit Med __Ac Sinusitis __Ac Phar,Pos Str __Bronchitis
__Furuncle __Allerg Rhinitis __Ac Phar,NOS __Headache

PLAN

TREATMENT
*__Temporary profile for: Type:
*__Quarters for:
__Return to clinic on:
__Pen V 250 mg #40 1 qid x10d
__Erythro 250mg #40 1 qid x10d
__Cortisporin Otic 10cc 4gtt qid x10d
__Hydrocort Cm 1% 30 GM Apply bid
__Aspirin 325 mg #30 2 q6h prn
__Acetaminophen 325 mg #30 2 q6h prn
__Cepacol Loz #24 1 q4h prn
__Robitussin DM 4oz 1 tsp q4h prn
__Dimenhydri 50 mg #12 1 q6h prn
__Chlorphen mal 4 mg #50 1 q6h prn
__Actifed #30 1 tid
__Dimetapp #20 1 bid
__Neosynephrine 0.25% 15cc 2gtt qid x10d
*__Other than AMOSIST Manual:

CONSULTATIONS & REFERRALS
__Throat culture __Ear culture
__Ear canal irrigat __Monospot
__Sinus x-rays __Nose culture
__Chest x-ray
DISPOSITION
__Duty or home
*__Hospital ward:
*__Other:

SEEN BY amosist m.d.

O=no /+=yes/R=+ rt side/L=+ lt side/RL=+ both sides/#=do only if requested/*=MD trans if +

FULL NAME:
SSN__ __/__ __ __/__ __/__ __ __ __ FIRST VISIT yes no
BIRTH YR__ __ SEX m f STATUS spons dep
SPONS act ret res oth SERVICE ar af mar nav oth
RANK: UNIT:
TELEPHONE home__ __ __/__ __ __ __work__ __ __/__ __ __ __

Table 5

CATEGORIZATION OF TYPE A AND TYPE B ERRORS BY TYPE OF DCS ENTRY

CATEGORY OF DCS ENTRY	TYPE I ERRORS	TYPE II ERRORS
Symptom - Related Errors:		
Subjective Symptom	41.8%	25.3%
Objective Symptom	12.4%	28.7%
Subtotal	54.2%	54.0%
Treatment - Related Errors:		
Prescription	45.8%	35.9%
Diagnostic Tests/ Consultations	N/A	7.8%
Disposition	0.0%	2.3%
Subtotal	45.8%	46.0%
TOTAL	100.0%	100.0%

nearly 54 percent of all Type A and Type B errors occurred within the symptom-related portion of the DCS.

4.2.3.5.3 Treatment-Related Errors. In complementary fashion, the proportions of Type A and Type B errors detected in the treatment-related portion of the DCS were also very nearly equal to one another. As regards, the treatment-related Type A, (asterisked-entry) errors, all were prescription-related. For the most part, however, these errors reflected the absence of a required physician consultation to approve the prescription of one or more medications not appearing on the DCS. In most of these instances, however, the prescribed medications were viewed as being similar in their effects to the logic-directed medication. A similar disclaimer is appropriate to the Type B, logic-related prescription findings. An examination of these latter errors revealed that most of them were due either to (a) the lack of a prescription for symptomatic relief medication (such as aspirin), or (b) the use of the logic designated "alternate" drug in the absence of any contraindication for the "drug-of-choice" (such as prescribing, in the absence of physician direction, acetaminophen instead of aspirin or, in the more serious instances, ampicillin instead of sulfisoxazole).

4.2.3.6 Findings Pertaining to Specific Algorithms and Diagnoses. Further particulars regarding Type A errors for the URI algorithm are found in Appendix A. Additional information and comments pertaining to Type B, logic-related errors for individual URI diagnoses are provided in Appendix B. The description focuses upon the most frequently occurring diagnosis, non-specific acute pharyngitis. An extended discussion of Type B, logic-related errors for the second most frequently occurring diagnosis in the entire sample, cystitis, is provided in Appendix C.

4.2.3.7 Program Impact. On the basis of the strict audit criterion employed herein, the present findings indicate that to the extent that care provided in direct, total compliance with an algorithm is labelled as "safe" care, very few, less than three percent, of patients treated solely by AMOSISTs received "safely" delivered care. This finding is considered even more profound when recognition is given to fact that this analysis reflects (a) the performance of AMICs chosen because they were judged to be among those whose operation appeared to be most efficient and most in accord with existing program guidelines, and (b) the performance of AMOSISTs dealing with a "simplest case" sample comprised of only those patients for which a single diagnosis was rendered.

4.2.4 Field Audit Criteria

4.2.4.1 The findings which have been cited have been derived from both rather strict and not-so-strict criteria. The use of the term "strict" stems from the fact that the findings resulted from the rather rigid application of an overlay transparency to each DCS. If the recordings evidenced upon the DCS were not in strict accord with the markings appearing in the overlay, an error was recorded. On the other

hand, the findings are considered to be conservative (derived from "not so strict" criteria) because no effort was made to determine if the entries pertaining to the subjective and objective findings recorded in the upper half of the DCSs were compatible with some diagnosis other than that which had been rendered. However, it is the opinion of the writer that the audit process employed herein was much more rigorous than that encountered during Phase I on-site visits to any of the AMICs (Schopper, 1978a). In contrast to the audit procedures (or lack of same) observed during these visits, those presently employed might be considered unrealistic in their demands for adherence to the algorithm. Hence, in order to determine if this was, in fact, the case, a random sample of 40 percent of the DCSs evaluated were provided to a former NCOIC of a large AMIC for his independent evaluation.

4.2.4.2 When the DCSs were given to the NCOIC, he was informed of the concern expressed above, and he was asked to make a gross evaluation of the adequacy of each of the DCSs provided to him according to the following three categories: (1) Acceptable, (2) Marginally Acceptable, (3) Unacceptable. He was not given criteria with which to define each of the categories cited in order that his judgement not be biased. The results of his independent evaluation of the 117 DCSs provided to him were as follows: 30.0 percent were judged to be acceptable, 12.8 percent were judged to be marginally acceptable, and a sizeable 57.2 percent were judged to be unacceptable. Hence it appears that even from the prespective of a former AMIC NCOIC, the majority of the DCSs evaluated were found to be significantly lacking in their overall adequacy.

4.2.5 Additional Findings: DCS Utilization.

4.2.5.1 Findings which relate somewhat less obviously to the issue of the safety and effectiveness of AMOSIST-delivered care are those which pertain to the extent to which the AMOSISTs employed current DCSs. If the AMOSIST does not utilize a DCS, there is no ready manner to determine whether or not he performed in accordance with the algorithm that he was supposed to utilize. Furthermore, HSC guidelines (APC Model #13, 1976) indicate that the AMOSIST is to initiate a DCS for every patient he treats. The findings relevant to this issue based upon an analysis of the 905 DCSs utilized in the retrospective patient return rate evaluation (paragraph 4.3) are depicted in Table 6.

4.2.5.2 With the exception of treatment for injuries addressed by the Musculoskeletal (MS) extremity algorithm, it is observed that DCSs were not initiated for between 12.8 percent and 18.2 percent of the patients treated by AMOSISTs. (The findings for the excepted MS, Extremity algorithm showed much higher compliance, i.e., for only 4.8 percent of the patients was a DCS not initiated.) Overall, DCSs were not employed for 13.2 percent of the patients treated by AMOSISTs. Because all patients treated by AMOSISTs have been included; i.e., both those for which the AMOSIST sought physician consultation (which are, therefore, exempted from the constraints of the algorithm) and those for which the AMOSIST completed treatment without consulting a physician,

Table 6

UTILIZATION OF CONTEMPORARY ALGORITHM DATA COLLECTION SHEETS *

ALGORITHM	TOTAL NO. PATIENTS	ALTERNATE FORM UTILIZED SF 600	OLD DCS	TOTAL
Eye (1)	21	14.3%	4.8%	19.1%
Respiratory (2)	450	12.8%	2.2%	15.0%
Gastrointestinal (3)	64	15.6%	7.8%	23.3%
Genitourinary (4)	104	13.5%	3.8%	17.3%
Musculo-Skeletal, Spine (5)	7	14.3%	0.0%	14.3%
Musculo-Skeletal, Extremity (6)	84	4.8%	9.5%	14.3%
Skin, Regional (7)	88	18.2%	0.0%	18.2%
Skin, General (8)	87	16.1%	0.0%	16.1%
All (1-8)	905	13.2%	3.2%	16.4%

* A new series of data collection sheets had been authorized for use approximately two months prior to the beginning of the study. The sites participating in the study were informed by the distributor of these new versions that they were to continue to use the existing forms until the data collection for the study had been completed. Hence, the term "contemporary" means the DCSs that were depicted in the July 1975 version of the AMOSIST Manual.

one might be tempted to argue that these findings are not appropriate ones with which to address these issues of safety and effectiveness of care. However, this argument is fallacious, for it implies that at the outset of treatment (the time at which an AMOSIST must make a choice regarding the form upon which he is to record his findings) the AMOSIST can differentially detect apriori which patient's complaints are going to require that he consult with a physician before he has completed his treatment.

4.2.5.3 Table 6 also portrays additional related data; i.e., that of the extent to which AMOSISTs employed outdated DCSs. Relative to the frequency with which SF 600s are employed in lieu of DCSs, the use of outdated DCSs (3.2 percent overall) is observed to be much less of a problem. Nonetheless, the continuing use of old DCSs does pose a potential care-related problem if the contemporary DCSs address data which are not cited within previous editions. Too, even if no additional content is addressed, the change in format which occurs requires that the individual(s) performing the audits of the DCSs be familiar with more than one format if that function is to be performed efficiently.

4.2.6 Additional Findings: Frequency of Occurrence of Categories of Illness and of Diagnoses.

4.2.6.1 General. Information which is seemingly extraneous to the general purpose of this report is that which pertains to (a) the frequency with which the eight general algorithms are utilized and (b) the frequency with which the diagnoses contained in the AMOSIST Manual are rendered. The 905 DCSs used in the evaluation of patient return rates (paragraph 4.3) was utilized as the sample for the present evaluation. The relevance of the present findings of the issue of "safety-of-care" is discussed after the findings have been described.

4.2.6.2 Algorithms. The findings depicted in Table 6 clearly show the Musculo-Skeletal, Spine algorithm to be that which was least utilized. Less than 1 percent (0.78 percent) of all patients treated by a single algorithm employed this algorithm. Relative to most remaining algorithms, (which ranged in utilization from 6.7 percent to 47 percent), the Eye algorithm was also infrequently utilized. Only 2.2 percent of the 905 patients in the sample being discussed were seen for eye problems.

4.2.6.3 Diagnoses. Within the various algorithms there were also specific diagnoses which were very infrequently encountered. All diagnoses encountered two or less times are cited in Table 7. It is apparent that a substantial portion of the diagnoses cited in some of the algorithms--particularly the Respiratory, Genitourinary, MS Extremity, and Skin-Regional algorithms--are little used. Overall, it is noted that 20 (38.5%) of the 52 possible specific diagnosis contained in the existing AMOSIST Manual have occurred two or less times in the present sample of 905. Nine (17.3%) never occurred.

4.2.6.4 The findings depicted in Table 7 indicate that only 13

Table 7

DIAGNOSES INFREQUENTLY ENCOUNTERED IN THE PRESENT RETROSPECTIVE AUDIT OF 905 AMOSIST-TREATED PATIENTS

ALGORITHM	DIAGNOSES (NUMBER OF TIMES ENCOUNTERED *)
Eye (1)	Blepharitis (0), Chalazion (0), Subjunctival Hemorrhage (0)
Respiratory (2)	Toxic Labyrinthitis (0), Furuncle (0), Chronic Otitis Externa (0), Streptococcal Sore Throat (1), Acute Laryngitis, Non-specific (1m)
Gastrointestinal (3)	None (Only two specific diagnoses are renderable; both used)
Genitourinary (4)	Genitourinary Gonorrhea (0), Urethritis, Non-specific (1), Vaginitis, Trichomones (1m), Vaginitis Candida (1,1m),
Musculo-Skeletal, Spine (5)	Other (0)
Musculo-Skeletal, Extremity (6)	Bicipital Tenosynovitis (0), Supraspinatus Tendinitis (2), Ankle Sprain (2)
Skin,Regional (7)	Tinea Cruris (0), Pediculosis Pubis (1), Tinea Pedis (1,1m), Pseudofolleculitis (2)
Skin,General (8)	Tinea Corporis (0)

* The letter "m" appearing as a subscript indicates that the diagnosis appeared in conjunction with one or more other diagnoses addressed within the algorithm.

of 905 patients were treated for illnesses included among the 20 diagnoses cited. This suggests that a substantial portion of the AMOSIST Manual, nearly 40 percent of the 52 specific diagnoses contained within it, addresses diagnoses which are applicable to but a small portion of the patients seeking treatment. One implication of these findings is that the AMOSIST Manual is inefficient to utilize. As a consequence, it is likely that such inefficiency has contributed substantially to the AMOSIST's defacto decision not to utilize the AMOSIST Manual, a decision which, in turn, has adversely affected the "safety-of-care" aspect of the program. The rationale is similar to that previously employed in discussing the apparent unwillingness of AMOSISTs to record vital signs; i.e., a tendency (not confined to AMOSISTs) to disengage from tasks which have little impact upon their work and require increased amounts of time and effort for their accomplishment. The implicit, unverbalized question which is believed to have been posed and answered by the AMOSIST is "Why should I continue to regularly employ a series of instructions when nearly 40 percent of those instructions have no impact upon my ultimate decision and course of action? To do so is not only boring and frustrating, but it is generally nonproductive." The answer which is behaviorally expressed is clear: As indicated in the initial report (Schopper, 1978a), they do not use it.*

4.2.6.5 The decision not to use the AMOSIST Manual leaves the AMOSIST with two alternatives, neither of which is desirable: either rely on his own memory (a tactic which the reults of the present evaluation has shown to be ill advised) or rely on the physician by increasing the frequency of requested consultations (a tactic which is not cost effective). This circumstance, the existence of a substantial number of rarely used instructions, is also one that is likely to have had a similar negative impact on any effort to invoke regularly employed, formally documented audit procedures since the auditor would be similarly burdened. This absence of use of the AMOSIST Manual, the AMOSISTs' primary medical reference, by both the AMOSISTs and those who perform the audits, is believed to be a principal contributor to their inability to deliver error free (as defined herein "safe") medical care. Since the sole impact of eliminating entirely these 20 rarely used diagnoses would be that of a very small increase (.56%) in the proportion of AMOSIST-treated patients

* As cited in the initial report, another substantial factor contributing to the lack of utilization of the AMOSIST Manual is the AMOSISTs aversion to making overt reference to it while treating the patient--an action which he feels conveys a sense of ineptitude to the patient.

requiring a physician's consultation in order to complete their treatment,* a need to reexamine the range and quantity of illness specifically addressed in the AMOSIST Manual is clearly indicated.**

4.2.7 DCS Error-Rate: Comparison with BAMC/University of Washington Project.

4.2.7.1 General. The results of the DCS audits presented herein are not particularly laudable. Of the entire sample of 282 records audited, only 8 (2.8%) were entirely devoid of error. This is in sharp contrast to the results which are reported to have been obtained from the AMIC at BAMC.*** Therein, between 75 and 85 percent of the DCSs for each of the algorithms which have been investigated there (URI, headache, back pain, and pediatric URI) have been error-free. While the actual algorithms employed at the BAMC do differ from those employed at AMICs in other Army hospitals, it is unlikely that these differences account for the entire difference observed in the error rates between these two systems. The discussion which follows summarizes several of the factors which are likely to contribute to the existing disparity.

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* The 0.56 percent increase cited assumes that the base rate of requests for physician consultations (62 percent in the overall sample of 905 being considered) would be applicable to the portion of the sample (the 13 of the 905) being discussed. The actual increase in the proportion of patients requiring a physician consult as a result of the deletion of these 20 diagnosis would be only that proportion of the entire deleted percentage (13 of 905, 1.44%) in excess of 62 percent, i.e., 38% of 1.44% or 0.56%.

** While a need to reconsider the scope of the AMOSIST Manual from the viewpoint of the relative utility of the diagnoses included is clear, the existence of a possible seasonal bias of unknown magnitude in the present findings, it would be appropriate to examine the issue more fully prior to undertaking a revision. While it is the case that the present sample included not only the single diagnosis DCSs, but also the multiple diagnosis DCSs (inclusive of those for which as many as three, four, and occasionally five diagnosis were indicated), it is nonetheless, noted that the data from which these findings were derived were obtained from only two sites and were collected during a three and one-half month period from mid-February through May. Nevertheless, the present findings rather strongly suggest that the scope of the illnesses addressed is too large.

*** Too, civilian care providers (MEDEXs) trained at a level equivalent to the US Army's Physician Assistant (PA) have utilized similar algorithms and have been reported to have performed at a 47 percent error-free level of proficiency in a study of 3024 patients involving algorithms for 11 type of illnesses (Sox et al, 1973).

4.2.7.2 DCS Format. The URI DCS utilized at BAMC is depicted in Figures 2 and 3. This is contrasted with the URI DCS utilized by the sites studied at the time of the data collection for the present study (Figure 1) and the URI DCS which is presently being utilized at all Army AMICs other than the one at BAMC (Figure 4). Albeit the more recent version of the non-BAMC DCS appears better organized and more aesthetically appealing than its predecessor, the content is not changed. Its sole purpose remains as that of a checklist, a form which serves merely as an organized vehicle upon which to collect the clinical data. This is in considerable contrast to the BAMC URI DCS which serves multiple purposes. On this DCS, not only are places provided to record the findings, but it also concisely depicts the algorithm to be followed on the reverse side (Figure 3). One principal advantage which derives from this format is the elimination of the need to utilize a separate reference manual during the actual course of treatment. As indicated in the initial report of this series (Schopper, 1978a), AMOSISTs working at the sites evaluated in the present study were found to have avoided the overt utilization of their AMOSIST Manuals. At no time was an AMOSIST Manual observed on the top of an AMOSIST's desk. Further, it was found that AMOSISTs occasionally were unable to locate their manual at all on the hospital premises. The impression obtained from speaking with AMOSISTs about the matter was that their avoidance of the AMOSIST Manual was due more to their desire not to appear dependent upon a manual in the eyes of their patients than from their perceptions that their knowledge was such that they no longer needed to consult it. Clearly, by printing the algorithm directly upon the same form utilized to record the data, the apparent dependence of the AMOSIST upon the guidance provided by an algorithm is much less obvious to a patient, and the aversion to employing same is likely to be markedly decreased.

4.2.7.3 Algorithm Simplicity.

4.2.7.3.1 Aside from the differences in formats associated with the DCSs themselves, another factor which may have contributed to the gross disparity in error rates is that the BAMC algorithm is easier to understand and utilize. From a global perspective, it is the writer's opinion that this is true, at least as regards the algorithm that is most frequently employed, the URI algorithm. While no independent data have been gathered to formally evaluate this possibility (e.g., as by having a group of physicians or AMOSISTs independently rate the two algorithms on the dimension of "ease-of-utilization"), some readily documentable observations appear to offer some support for the writer's contention. The first is that the number of possible diagnoses which may be rendered is markedly smaller for the BAMC algorithm than for its counterpart (See Figures 2 and 4). Only seven specific conditions, plus the alternative "other," are indicated on the BAMC DCS (see lower right hand corner of Figure 2 under the subheading "TREATMENT PROTOCOLS"). In comparison, the non-BAMC DCS cites 16 specific diagnoses and "Other" (see middle of Figure 4 under the heading "ASSESSMENT"). While the list of illnesses addressed by the AMOSIST Manual is clearly longer, longer does not necessarily mean better. The findings of the present study (discussed

Figure 2

CHECKLIST SIDE OF DATA COLLECTION SHEET USED AT BROOKE ARMY MEDICAL CENTER

URI CHECKLIST (#13)

__New Visit
__Return Visit (within 2 weeks)

AMOSISTS: Mark ALL Findings √=Present, 0=Absent (absence of mark means item wasn't examined).
X,Q = Physician Disagrees with Presence or Absence of a Finding or Plan.

SUBJECTIVE DATA:
Chief Complaint:_____ Medication(s):_____

Duration_____(days): __1 1-7 days __3 15-21 days __2 8-14 days __4 >21 days

Allergy(s):_____

Age: __5 Age 12-35 years __6 Age ≥ 55 years

__7 Sore throat/swallowing pain
__8 Hx strep exposure
__9 S/P tonsillectomy
__10 Facial/dental pain
__11 Runny/stuffy nose
__12 Hx shaking chills
__13 Cough present-
__14 Productive
__15 Chronic (6 mo/2 yr)

__17 Pneumonia in past 5 yr
__18 Chest pain-
__19 Pleuritic
__20 Precordial/Substernal/ Exertional
__21 Smokes cigarettes-
__22 <20 pk-yrs
__23 20-40 pk-yrs
__24 >40 pk-yrs

Right/Left Ear Symptoms-
__/__25 Pain
__/__26 Tinnitus
__/__27 Loss of hearing
__28 Chronic Diseases-
__90 Heart Disease
__91 Kidney Disease
__92 Diabetes (on medication)
__93 Asthma/Lung Disease
__95 Blood Disease
__99 Other:_____

OTHER HISTORY:

OBJECTIVE DATA: Temp:____ __29 ≥ 101°F Resp:____ __30 ≥ 30/min Pulse:____ *BP(optional)*___/___

__31 Tonsils present
__32 Abnormal throat exam-
__33 Tonsils swollen
__34 Red throat
__35 Exudate present
__36 Lymphoid hyperplasia
__37 Other:_____
__38 Abnormal nasal exam-
__39 Purulent discharge
__40 Non-pur. discharge
__41 Other:_____
__42 Sinus tenderness:
Right/Left
___/___ *Frontal*
___/___ *Maxillary*

__43 Ant. cervical nodes enlarged
__44 Post. cervical nodes enlarged
__*45 Spleen palpable (MD data)*
__46 Abnormal chest exam-
__47 Localized chest findings
__48 Rales:_____
__49 Accessory muscles used
__50 Poor expansion, unilateral
__51 Dullness:_____
__52 Chest wall tender:_____
__53 Hyperresonance
__54 ↓ Breath sds:_____
__55 Wheezes:_____

__56 Abnormal ear exam-
Right/Left Sided
__57 __58 Foreign body/wax present
__59 __60 Obstruction after attempted removal
__61 __62 Ext. canal inflamed/pus
__63 __64 Tympanic membrane obscured
__65 __66 TM abnormal
__67 __68 TM red/bulging
__69 __70 TM loss of light reflex
__71 __72 TM loss of landmarks
__73 __74 TM air-fluid level
__75 __76 Scarred TM
__77 __78 Other ear abnormality

OTHER PHYSICAL:

PLANS:
__103 Throat culture
__109 WBC with differential
__110 Mono spot
__111 Chest xray
__149 Other (per MD = Q)
__ _____
__ _____
__ _____
__ _____

RESULTS:
__79 Pos. for β-strep
__80 Atypical lymphs present
__81 Mono spot positive
__82 Infiltrate present
__ _____
__ _____
__ _____
__ _____

TREATMENT PROTOCOLS:
__150 A__205 B__206 Strep throat antibiotic
__151 Sympt. sore throat
__152 A__207 B__208 Runny nose
__153 A__209 B__210 C__211 Acute sinusitis antibotic
__154 Otitis externa
__155 A__212 B__213 C__214 Otitis Media
__167 A__215 B__216 Cough
__217 A__218 B__219 C__220 Pneumonia
__175 *Other (per MD = Q):*_____

INITIAL ASSESSMENT:

PHYSICIAN INVOLVEMENT:
__102 MD examined patient
__221 MD verbally consulted
__222 MD not involved

PATIENT IDENTIFICATION:

DATE_____
AMIC #_____
AMOSIST #_____
TIME IN_____
TIME OUT_____

SIGNATURES:
AMOSIST_____
M.D._____

(reduced size)

Figure 3

ALGORITHM SIDE OF URI DATA COLLECTION SHEET USED AT BROOKE ARMY MEDICAL CENTER (BAMC)

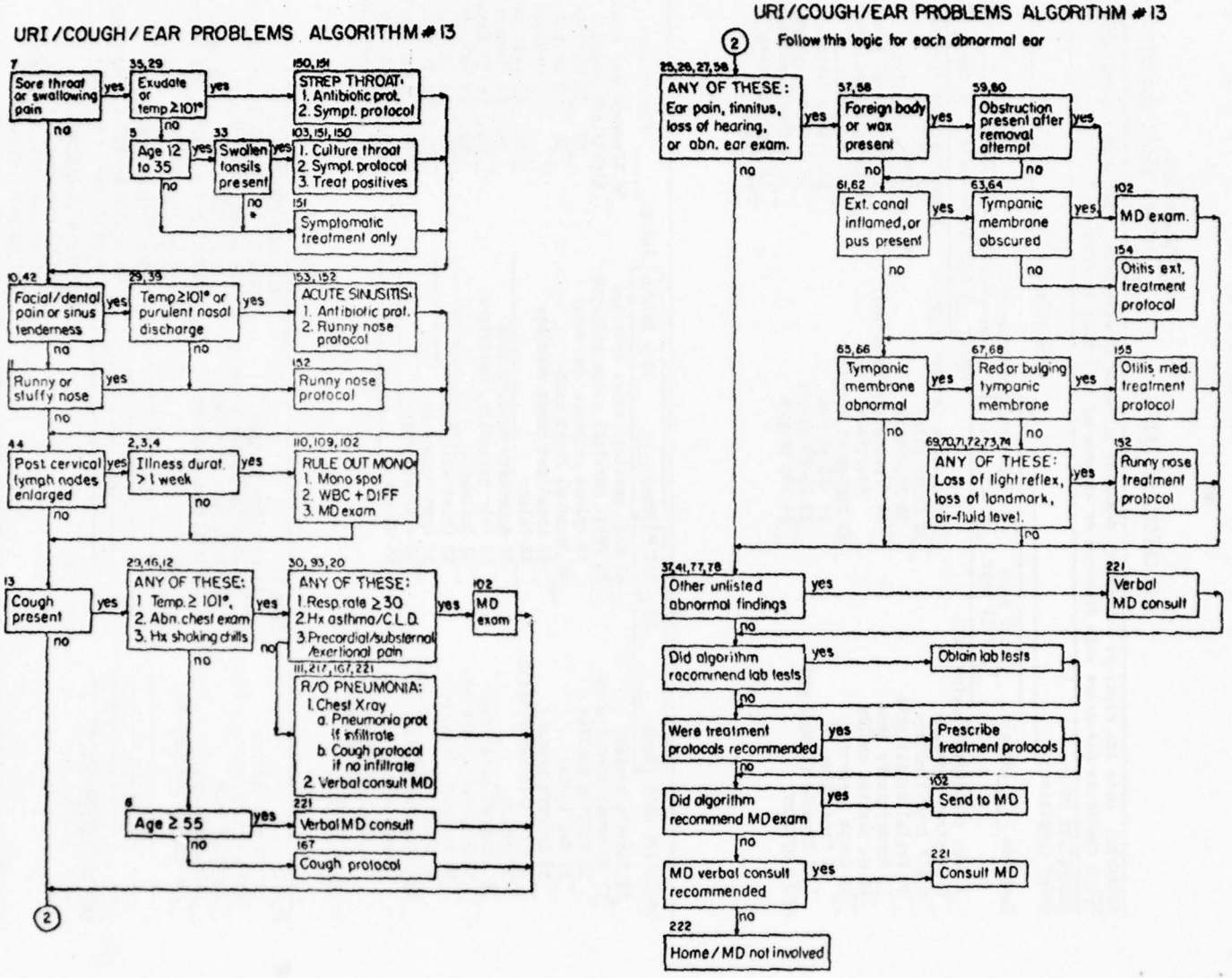

Figure 4

LATEST VERSION OF RESPIRATORY DATA COLLECTION SHEETS USED AT US ARMY MEDDACS

ACADEMY OF HEALTH SCIENCES
MED & SURG DIV AMOSIST SEC

M 28-300-015-1
048

	RESPIRATORY - CHIEF COMPLAINT(S) & DURATION	TIME SEEN
DATE:		TIME OUT

SUBJECTIVE DATA

___ Chief complaint correct at Triage
*___ Possibly pregnant
*___ Fever for more than 5d
*___ Taking MD ordered med:
*___ Return visit for unchanged problem
*___ Shaking chills
*___ Rash for less than 5d
#___ Contraindicated med:

THROAT & NECK
___ Pos TC in last 10d
___ Pos TC in family now
___ Past hx rheum fever
___ Sore throat for:
___ Hoarseness for:

NOSE & SINUS
___ Nasal congestion
___ Nasal drainage
___ purulent
___ recurrent/seasonal
___ watery
___ Itching eyes/nose
___ Tearing
#___ Sinus x-ray in last 3 mon.
___ Runny nose for:

___ OTHER:

EAR
___ Tinnitus *___ severe
___ Vertigo *___ severe
___ Earache for _____ days
___ Decreased hearing
___ Ear itching

CHEST
*___ Shortness of breath
___ Cough for _____ days
___ not improving
*___ productive/purulent
*___ bloody sputum
___ Chest pain ___ mild

OTHER
___ Headache for:

OBJECTIVE DATA

TEMP _____ PULSE _____ RESP _____ BP _____

*___ Abnormal vital signs
*___ Appears severely ill

THROAT & NECK
___ Red pharynx
___ Tonsillar exudate
*___ Peritonsillar swelling
___ Lymph nodes
*___ posterior
___ tender anterior

NOSE & SINUS
___ Nasal drainage
___ watery
___ purulent
*___ active bleeding
___ Nasal muc swollen & red
*___ Facial swelling
___ Sinus tenderness

CHEST
#*___ Unequal breath sounds
#*___ Rales, rhon or wheezing
#___ Chest point tenderness

OTHER
#*___ Decreased neck flexion

___ OTHER:

EAR
___ Mastoid tenderness
*___ severe
___ Ear drainage
*___ bloody
___ white - yellow
___ TM not visible
___ canal fill with wax
___ TM loss of landmarks
___ TM redness
___ TM air fluid level
___ TM bubbles
*___ TM retracted
*___ TM scar
*___ TM perforated
___ Canal tenderness
___ Canal swollen ___ red
___ local
*___ pointing
___ outer half
___ Ear fissures/scales

ASSESSMENT

___ Labyrinthitis
___ Acute otitis media
___ Acute serous otitis media
___ Furuncle
___ Acute otitis externa
___ Chronic otitis externa
___ Acute sinusitis
___ Allergic rhinitis
___ Rhinitis, NOS
___ Strep sore throat
___ Acute pharyn, poss strep
___ Acute pharyngitis, NOS
___ Laryngitis
___ Costochondritis
___ Bronchitis
___ Headache
*___ OTHER than AMOSIST Manual:

TREATMENT

*___ Temporary profile for:
*___ Quarters for:
___ Return to clinic on:
___ PEN VK 250 mg # 40, 1 tab QID x10d
___ ERYTHROMYCIN 250 mg # 40, 1 tab QID x10d
___ CORTISPORIN Otic Solution 10cc, 4 ggt QID x10d
___ HYDROCORTISONE Cream 1% 30 Gm apply BID
___ ASPIRIN 325 mg # 40, 2 tabs Q6H prn
___ TYLENOL 325 mg # 40, 2 tabs Q6H prn
___ CEPACOL Lozenge # 24, 1 loz Q4H prn
___ ROBITUSSIN-DM 120cc, 1 tsp Q4H prn

PLAN

___ DRAMAMINE (Dimenhydrinate) 50 mg # 12, 1 cap Q6H
___ CHLORTRIMETON 4 mg # 30, 1 tab Q6H prn
___ ACTIFED # 30, 1 tab TID prn
___ DIMETAPP Extentabs # 20, 1 tab BID
___ NEOSYNEPHRINE Sol 0.25% 15cc, 2 ggt QID prn
*___ OTHER than AMOSIST Manual:

ADDRESSOGRAPH or Name, FPN, SSN, DOB, Sex, Phone Number, MTF, Status

CONSULTATIONS & REFERRALS
___ Throat culture
___ Ear canal irrigation
___ Sinus x-rays
___ Chest x-ray
___ Ear culture
___ Monospot
___ Nose culture

DISPOSITIONS
___ Duty or Home
*___ Hospital ward:
*___ Other:

AMOSIST _____ MEDICAL DOCTOR _____

+ = POS / R = + right side / RL = + both sides / * = MD transfer if + (POS)
O = NEG / L = + left side / # = do only if requested

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earlier, paragraph 4.2.6.3, Table 7) suggest that the present URI algorithm contains "excess baggage" in that six of the 16 specific diagnoses were observed to have occurred either not at all or only once among 450 URI cases evaluated. (These data included both single and multiple diagnoses occurring among the DCSs evaluated in the retrospective DCS sample.) In contrast to this, seven of the eight conditions addressed by the BAMC algorithm evidence an incidence ranging from 6-29 percent among the URI patients treated. Pneumonia was the sole BAMC exception, appearing among only one percent of the patients; nevertheless, this rate is approximately four and one-half times that evidenced among the most frequently occurring of the six "little-utilized" diagnoses of the non-BAMC algorithms. Stated somewhat differently, the findings of the present study suggest that the number of specific diagnosis addressed in the URI algorithm of the AMOSIST Manual could be reduced nearly 40 percent (from 16 to 10) while affecting the treatment of less than one-half of one percent (.44%) of the patients examined. (The term "affecting" is used to denote simply that the treatment for these patients, as a result of their not having received a diagnosis that was algorithm-directed, would have to involve a physician consultation.)

4.2.7.3.2 A finding related to those cited above concerns the number of logic blocks addressed in the algorithm. The complete URI algorithm appearing in the AMOSIST Manual is comprised of 142 logic/decision blocks (including nearly 55 which address the issue of medications and contraindications for same--nearly one-half of which are concerned with making a choice between aspirin and acetaminophen). The BAMC algorithm (Figure 2) has only 46 logic/decision blocks.

4.2.7.3.3 These observations, which pertain solely to the URI algorithm, are clearly consistent with those made earlier regarding the AMOSIST Manual as a whole and serve to reinforce the previously made assertion that there exists a need to revise and delimit the range of illnesses addressed in the AMOSIST Manual and attendant DCSs in order to increase the efficiency of the program and decrease the likelihood that the algorithms will be rejected by the intended user as the result of boredom and frustration at having to utilize a high effort, low yield reference.

4.2.7.4 Personnel Selection and Work Environment.

4.2.7.4.1 This issue has been more thoroughly discussed elsewhere (Schopper, 1978a; HSC Memorandum, 1976). As it pertains herein, it is likely that some portion of the difference observed in the error rates encountered between BAMC AMOSISTs and those encountered in the present study are due to (a) differences in the personnel selection processes respective to each of the systems and (b) the working environment which exists at each. In brief, BAMC is one of the Army's major medical training facilities and is, therefore, a facility which is reasonably well staffed with highly qualified personnel. Furthermore, the AMIC which exists there is the focus of a large scale, well funded clinical research program intended to develop clinically validated algorithms appropriate for use by AMOSISTs. The AMOSISTs and the AMIC are, therefore, the object

of considerably more interest and attention than typically exists at most other sites. The AMOSISTs who work there go through a thorough screening process to select the more capable individuals. Additionally, if attrition rate can be taken as a valid indication, the training demands which exist and the criteria employed for success in the AMOSISTs' "OJT" training phases are much more rigorous at BAMC than at any other facility. The attrition rate (42% during the past fiscal year) among BAMC AMOSIST candidates during their OJT phases is markedly higher than that evidenced at any other facility. BAMC AMOSISTs are also subject to closer daily monitorship than is present at any other AMIC. They receive regular, daily computerized feedback and monthly individual counseling sessions regarding their performance. Furthermore, their continuation in the program is contingent upon their performance and the mutual consent of the AMOSIST and the supervising physician. There exists, therefore, a definite challenge in their work. Additionally, any tendency toward boredom is counteracted to some degree by the modification of DCSs which occasionally takes place as the algorithms are examined and evaluated.

4.2.7.4.2 The circumstances cited above are in contrast to the situation which exists elsewhere. At many other facilities the AMOSIST concept is less highly regarded. Auditing procedures are often elementary, performance related feedback is irregular and AMOSISTs make little direct use of the AMOSIST Manual (Schopper, 1978a). It is not infrequently the case that potential candidates for AMOSIST positions suffer a somewhat negative bias because of the unwillingness of existing services to release good-peforming, highly motivated personnel so that they may be considered for selction to be trained as an AMOSIST. Additionally, due perhaps to the apparent shortage of corpsmen in general (and to the investment in time that has been made to obtain resident AHS instruction), most sites seem to be reluctant to impose high standards and submit negative Phase II or Phase III OJT evaluations on their AMOSIST trainees.

4.2.7.5 Relative Importance of Factors: Some Soft Data. Several factors have been cited as being possible contributors to the disparity between BAMC error rates and those evidenced in the present study. Others, too, may be contributors e.g., BAMC's results for adult patients are confined to only three algorithms whereas the present data have addressed all eight algorithms employed by US Army MEDDACs. While there exists no formal data with which to assess the relative magnitudes of the contributions ascribable to each of these components in attempting to account for the observed difference, the implication of some "soft" data may be highly significant. When speaking to some of the BAMC AMOSISTs about their work, it was clear that the daily prospect of facing a computerized printout which critiqued their work of the previous day, and knowing that they were surrounded by physicians and researchers who were privy to and equally as interested as they, themselves, in those findings, combined to act as a profound motivating influence--one that made them adhere to their algorithms very closely. Although the computerzied output does, no doubt, lend a particularly impressive aspect to this procedure, it is the writer's viewpoint that similar results could be achieved by the regular and frequent presentation of the results of any meaningful audit in an informative manner by a significant supervisor (e.g., one's rater

or indorser) who shows real interest in the data and like concern for the maintenance of high standards. Though the contribution of "meaningful data" to the success of such a process is unquestioned, it is emphasized that the frequency of feedback and the role of the supervisor are also factors of considerable importance. That this is so is suggested by observations from studies being conducted by BAMC and the University of Washington. An example of the importance of the supervisor's role is the occurrence of some deterioration in the performance of BAMC AMOSISTs as the result of a brief period during which the BAMC AMIC came under the direction of a less-than-enthusiastic physician (personal communication, Wolcott, 1978). The importance of having frequent feedback is supported by data from the recent algorithm research addressing troop medical clinic sick call procedures at Fort Hood, Texas (Active Duty Troop Medical Clinic (ADTMC) Project, Wolcott, 1977) and at the Academy of Health Sciences, Fort Sam Houston, Texas. Unpublished data from this study show that irregular and, at times, infrequent feedback regarding the performance of corpsmen using a relatively simple triaging algorithm had little impact and yielded error rates averaging 32 percent over a three month trial period. However, the institution of a system of daily, immediate case-by-case feedback lowered the error rate to 2.5 percent within nine weeks.

4.3 Patient Return Rates.

4.3.1 General.

4.3.1.1 The data discussed in the previous sections addressed a function, adherence to algorithms, which was unique to the AMIC and focussed upon as the measure of "safety-of-care" employed in the study. As a result of the uniqueness of the function it was not possible to make any comparisons with GOC performance. The measure which addressed medical "effectiveness-of-care," that of the non-directed patient return rates, does permit a between-clinic comparison, however.

4.3.1.2 As employed in the present study the term "patient return rate" is operationally defined as any non-directed return to a medical facility to obtain additional treatment for an illness or medical complaint for which he had previously received care in an AMIC or GOC. For the purpose of the present study, the return visit had to occur within two weeks of the date of the initial treatment in the AMIC or GOC. The global instruction "p.r.n." (pro re rate: as needed, as desired) was not considered as an instruction to return for the present study; hence, any patient returns encountered wherein the initial visit contained these instructions were counted as non-directed returns. The comparison addressed only those patients treated for illnesses which were classifiable among eight categories of illness addressed by the AMOSISTs algorithms.

4.3.2 GOC versus AMIC Comparison. The return rates evidenced in the two types of clinics are presented in Table 8 for each of the categories of illness addressed in the study. AMIC return rates were found to be higher than those manifested by a GOC for three of the categories

Table 8

PATIENT RETURN RATES BY CATEGORY OF ILLNESS FOR GOCs AND AMICs

CATEGORY OF ILLNESS	TYPE OF CLINIC				STATISTICAL SIGNIFICANCE ($p \leq$)*
	GOC		AMIC		
	TOTAL NO. PATIENTS	PERCENT RETURN	TOTAL NO. PATIENTS	PERCENT RETURN	
Eye (1)	13	7.7	21	14.3	.61
Respiratory (2)	129	13.2	450	12.2	.49
Gastrointestinal (3)	47	14.9	64	10.9	.26
Genitourinary (4)	29	13.8	104	9.6	.29
Musculo-Skeletal, Spine (5)	30	13.3	7	0.0	.02
Musculo-Skeletal, Extremity (6)	58	17.2	84	8.3	.04
Skin-Regional (7)	19	5.3	88	6.8	.70
Skin-General (8)	42	9.5	87	11.5	.60
All (1-8)	367	13.1	905	11.0	.0950

* 2-tailed test

(Eye, Skin-Regional, and Skin-General); however, none of these differences were statistically significant. AMIC return rates were lower than GOC return rates for all other categories. For all but the two musculoskeletal categories, however, these differences were not statistically significant. (At Appendix A, Tables A1 through A3, the return rate data are presented in detail for each diagnosis encountered within each of the algorithms.) Overall, for all patients categorizable among the eight categories, the 2.1% difference in patient return rate evidenced in favor of the AMIC (GOC = 13.1%, AMIC = 11.0%, $p = .0950$) were not found to be statistically significant at the $p \leq .05$ level of confidence commonly employed. As regards this "overall" analysis, it is noted that the frequency with which the cases were observed among the various categories of illness were not comparable for the two types of clinics (chi-square = 53.1 significant at $p \leq .001$). Therefore, since the nonsignificance observed in the overall results may be due to the existence of compensatory differences within the data, additional analyses were undertaken using artifically constructed samples based upon extrapolation from observed return rates and distributions to determine if statistically significant overall findings would result if the AMIC-sample were treated in GOCs and vice-versa.

4.3.3 Supplemental Analysis: AMIC-Equated Comparison. The artifical sample is shown in Table 9. It was created for the GOC using the sample distribution characteristics (among the categories of illness) of the AMIC while retaining the return rates appropriate to it's own (the GOC's) original data for each of the categories of illness. This comparison addresses the question of whether or not (given the return rates observed in the raw data) the overall difference between the two clinics would be a significant one if the distribution of GOC patients among the categories of illness had been the same as that evidenced among AMIC patients. As observed in the last column, the magnitude of the overall difference is decreased (as is the likelihood that the difference is a statistically reliable one), but the difference continues to favor the AMIC.

4.3.4 Supplemental Analysis: GOC-Equated Comparison. The remaining possibility is that the lack of a statistical significance evidenced in the original overall comparison (i.e., the using of the raw data, Table 8) is due to compensatory characteristics observed among the distribution of cases in the AMIC data (again as above, allowing the return rate for each category of illness to remain the same for the respective clinics). The alternate hypothesis is, therefore, that if the distribution of patients within the AMIC sample is artifically made identical to that of the GOC sample, then a significant difference would result. In order to test this "GOC-equated" hypothesis, as rigorously (or as "sensitively") as the preceeding AMIC-equated hypothesis, it was first necessary to enlarge the GOC population to that of the AMIC. (This was done without disturbing the relative distribution characteristics of the GOC data by simply multiplying the number of patients within each category by the same constant.) Once this was done, then the number of patients in each category of illness for the AMIC data was then equated to the number of patients evidenced in the GOC data. (See Table 10).

Table 9

GOC VERSUS AMIC PATIENT OVERALL RETURN RATE COMPARISON UTILIZING AN EXPANDED, AMIC-EQUATED REDISTRIBUTION OF GOC PATIENTS

CATEGORY OF ILLNESS	TYPE OF CLINIC				STATISTICAL SIGNIFICANCE ($p \leq$)*
	GOC		AMIC		
	TOTAL NO. PATIENTS	PERCENT RETURN	TOTAL NO. PATIENTS	PERCENT RETURN	
Eye (1)	21	7.7	21	14.3	
Respiratory (2)	450	13.2	450	12.2	
Gastrointestinal (3)	450	14.9	64	10.9	
Genitourinary (4)	104	13.8	104	9.6	
Musculo-Skeletal, Spine (5)	7	13.3	7	0.0	
Musculo-Skeletal, Extremity (6)	84	17.2	84	8.3	
Skin-Regional (7)	88	5.3	88	6.8	
Skin-General (8)	87	9.5	87	11.5	
All (1-8)	905	12.4	905	11.0	.1902

* 2-tailed test

Table 10

EXPANDED GOC VERSUS AMIC OVERALL PATIENT RETURN RATE COMPARISON

INVOLVING GOC-EQUATED REDISTRIBUTION OF AMIC PATIENTS

CATEGORY OF ILLNESS	TYPE OF CLINIC				STATISTICAL SIGNIFICANCE ($p \leq$)*
	GOC		AMIC		
	TOTAL NO. PATIENTS	PERCENT RETURN	TOTAL NO. PATIENTS	PERCENT RETURN	
Eye (1)	32	7.7	32	14.3	
Respiratory (2)	318	13.2	318	12.2	
Gastrointestinal (3)	116	14.9	116	10.9	
Genitourinary (4)	71	13.8	71	9.6	
Musculo-Skeletal, Spine (5)	74	13.3	74	0.0	
Musculo-Skeletal, Extremity (6)	143	17.2	143	8.3	
Skin-Regional (7)	47	5.3	47	6.8	
Skin-General (8)	104	9.5	104	11.5	
All (1-8)	905	13.1	905	9.9	.0136

* 2-tailed test

When the overall return rates are compared under these conditions it is evident that the lower AMIC return rate which results (9.9%) is significantly different, $p = .0136$, from the GOC return rate (13.1%). This analysis suggests, therefore, that were the proportion of AMIC patients observed in each category of illness the same as those encountered in a GOC, the AMIC's overall patient return rate would have been significantly lower than that evidenced by the GOCs.

4.3.5 Additional Considerations.

4.3.5.1 In summary, the above analyses suggest that if GOCs were to treat patient populations distributed among the eight illness categories in the same manner as they were encountered in the AMICs, there would be no statistically significant difference in their overall patient return rates; however, if the reverse situation were to exist, the patient return rate for the AMIC would be significantly lower than that of the GOC.

4.3.5.2 While the above-cited findings regarding patient return rates are considered to be complimentary to the AMOSIST Program (i.e., the patient return rate for patients treated in a physician extender program is no higher--and, perhaps, somewhat lower--than for patients treated by physicians), there exists one significant caution to be cited: The reason for this condition may be that the GOC-treated patient population suffers illnesses which are relatively more severe or complicated than those treated in an AMIC. It is, in fact, the purpose of the triage function of the AMOSIST Program to steer away from the AMIC all patients who are viewed as having something more than an acute minor illness. Furthermore, many (if not most) of the illnesses addressed by the AMOSIST Program are viewed as self-limiting conditions for which the treatment is intended to effect little more than symptomatic relief. Since there exists no data with which to further examine the issue, the above-cited possibility remains as merely plausible conjecture. However, if one makes the assumption that each type of care provider is treating patients whose severity and complexity of illnesses are appropriate to the level of knowledge and training of their respective care providers, then the direct comparison (and the results thereof) is given some legitimacy.

4.3.5.3 A second factor to be considered in evaluating the return-rate findings is the previously mentioned bias in the manner in which the AMICs appearing in this portion of the study were chosen. That process was intended to assure that those included were among the most efficiently and effectively run programs of those which were operating in most accord with the AMOSIST Program guidelines. Hence, the present findings are likely to be more representative of the "potential" existing within the program than they are of the "typical" or average AMIC.

4.3.6 AMOSIST Consultation versus Non-Consultation Return Rates. In addition to the GOC versus AMIC patient return rate comparisons, the data were further examined to determine if physician consultations differentially affected the patient return rates. This was done by comparing the return rates evidenced among patients initially treated by AMOSISTs who consulted with a physician with those initially treated by an AMOSIST who did not consult with a physician. These data are depicted in Table 11. The findings show that although some statistically significant

Table 11

NON-DIRECTED PATIENT RETURN RATES FOR AMOSIST-TREATED PATIENTS

WITH AND WITHOUT PHYSICIAN CONSULTATION

ALGORITHM	TOTAL NO. OF CASES	NON-DIRECTED RETURN VISITS			
		WITH PHYSICIAN CONSULT ON INITIAL VISIT		WITHOUT PHYSICIAN CONSULT ON INITIAL VISIT	
		NUMBER OF CASES	PERCENT RETURNED	NUMBER OF CASES	PERCENT RETURNED
Eye (1)	21	14	14.3	7	7.4
Respiratory (2)	450	235	13.2	215	10.8
Gastrointestinal (3)	64	44	4.5	20	25.0
Genitourinary (4)	104	69	13.0	35	2.9
Musculo-Skeletal, Spine (5)	7	6	0.0	1	0.0
Musculo-Skeletal, Extremity (6)	84	63	6.4	21	9.5
Skin, Regional (7)	88	73	8.2	15	0.0
Skin, General (8)	87	56	10.7	31	12.8
All (1-8)	905	560	10.7	345	10.8

differences exist between these two groups among the various algorithms, the results of the comparisons do not consistently favor either consultation or non-consultation patients. In fact, as shown at the bottom line of the table, the overall results for these two groups are nearly identical with non-directed patient return rates of 10.7 percent and 10.8 percent for the consultation and non-consultation groups, respectively.

4.4 Additional Issues and Considerations.

4.4.1 Evaluation of Overlay Auditing Procedure. In the first of the series of reports concerning this study (Schopper, 1978a), it was indicated that there did not appear to exist an efficient means of meeting the auditing requirements stated in the AMOSIST Program's guidelines. Whereas the algorithm development and validation studies ongoing in the AMIC at Brooke Army Medical Center (BAMC) are supported by a computerized audit system, the AMIC sites in all other locations must rely on manual DCS auditing procedures which depend totally upon the expertise residing in, and the amount of time available to, the local AMOSIST Physician and/or the AMIC NCOIC. The criticism made was that it was unlikely (given the algorithms, DCSs, and data collection procedures employed) that there existed sufficient time in many of the AMICs to manually perform audits of DCSs in the amount required and in the detail necessary to make the results both representative and meaningful to either the auditor or the AMOSIST (assuming that the latter is given feedback concerning the quality of his work). As a result of these findings and criticism, it was suggested that one possible alternative to the manual auditing procedures might be the use of an overlay transparency approach such as was used in evaluating the DCSs analyzed in the present report. Based upon the experiences of the writer, the overall evaluation of this approach is that it is too limited in its applications to justify a recommendation for widespread use within the present system of operation. While a rigorous audit was possible in the present study, such a system (a) is vulnerable to mismatch as a result of distortions in the DCSs arising from differences among the various types and models of local photocopiers employed, and more seriously (b) is capable of addressing only about 20 to 25 percent of the records. (A more complete discussion of this audit technique appears in Appendix E.)

4.4.2 Alternative Integrated Data Collection Process.

4.4.2.1 Background. Previous paragraphs have summarized and discussed the findings pertaining to the extent to which AMOSISTs recorded their findings, assessment, and treatment plan in accordance with the algorithms provided for their use. These results were not complimentary to the AMOSIST Program. When contrasted with the findings from the AMIC at BAMC, the results clearly indicate the need for intervention and improvement. Although several factors were cited as being possible contributors to the poor performance of the AMOSISTs evaluated in the present study (vis-a-vis that of BAMC AMOSISTs) it is believed that another factor contributes to the errors observed; that being the fact that the data collection procedures employed reflect data collection processes which do not require the AMOSIST to provide

physical evidence that he has or has not utilized the algorithm in arriving at his diagnosis and formulating his treatment plan. For AMOSISTs serving at facilities other than BAMC, the algorithms are contained in a rather large, separate manual; a manual which is, in actuality, rarely consulted (and is even occasionally absent from the premises, Schopper, 1978a). For these AMOSISTs, there exists a need to integrate the algorithm and the DCS into a single document, a revised DCS which portrays the algorithm itself and demands that the AMOSIST record his findings in a manner which clearly documents the logic he has employed in examining and treating his patient. For AMOSISTs serving at BAMC, this need has been partially met. The DCSs for the algorithms which have been validated or are being studied are multipart, pressure sensitive, carbonized forms which contain the history and examination findings on one side (Figure 2), of each page and the algorithm itself on the reverse side of the last page (Figure 3). The BAMC AMOSISTs do not have the need to consult a separate manual to avail themselves to the logic of the algorithm; they merely have to turn the DCS over. Hence, this system of data recording is not only considerably more convenient, but is also a much more psychologically desirable one since the need (or requirement) to consult the algorithm is much less obvious to the patient when the referent is an integral part of the AMOSISTs work sheet.*

4.4.2.2 Existing Two-Step Process. As cited previously, however, the BAMC DCSs only partially meet the requirements stated; they do not meet the need to have readily obvious documentation of the logic employed by the AMOSISTs in determining the diagnosis and treatment plan. Since the need relates as much (if not more) to the audit-related aspects of the program as it does to the data recording aspects, the fact that this capability does not exist in BAMC's DCS is not nearly so critical as it is for other facilities because the data from the BAMC DCSs are transferred to computer cards and the (very thorough) audit is performed by a computer. At other AMICs, however, computerized audits are not possible; consequently, they must rely totally on manual audits unaided by any mechanical device (e.g., overlays). To provide to these AMICs a DCS which clearly depicts the

*As pointed out in the initial report, one reason why non-BAMC AMOSISTs do not consult the AMOSIST Manual is the negative impression they feel is conveyed to the patient regarding their competence by the need to physically thumb through a book as they complete the patient's examination and develop a treatment plan. Hence, the depiction of the algorithm on the DCS is apt to increase the use of the algorithms not only because it is more readily accessible, but also because it may lessen the AMOSIST's concern that the patient would believe him to be inept because of his use of same.

logic used by the AMOSIST in examining and treating his patients would, it is believed, greatly ease the auditing task and, therefore, increase the likelihood that meaningful audits could be performed on a daily basis.

4.4.2.3 Proposed Integrated Process. An example of the type of algorithm which is proposed is shown in Figure 5. The algorithm shown is the BAMC URI algorithm and the suggested modification consists merely of inserting a directional, blank check point box in the lines interconnecting the various logic boxes. The instructions to the AMOSISTs would be for them to indicate their logic flow by placing a mark (e.g., "✓") in the box appropriate to their decision following each decision/instructional block through which they passed during the course of their examination. If this system were adopted in conjunction with instructions to the AMOSIST to indicate at what specific point a logic overrule was imposed by a physician as the result of a consultation, e.g., a strike through the checkmark ("✓") as is employed in the BAMC data recording system, then (theoretically) all DCSs, regardless of the number of diagnoses, could be readily audited by hand. Since the logic trail would be unambigiously depicted on the reverse side of the last page of each DCS (the front side would retain much of the same information contained in the present DCSs), the level of skill and medical knowledge required to perform the audit would be markedly reduced. Hence, the existing HSC guidance that physicians performed all DCS audits could be substantially relaxed (e.g., require that he perform an audit of only some randomly selected small percent of those previously audited by the NCOIC).

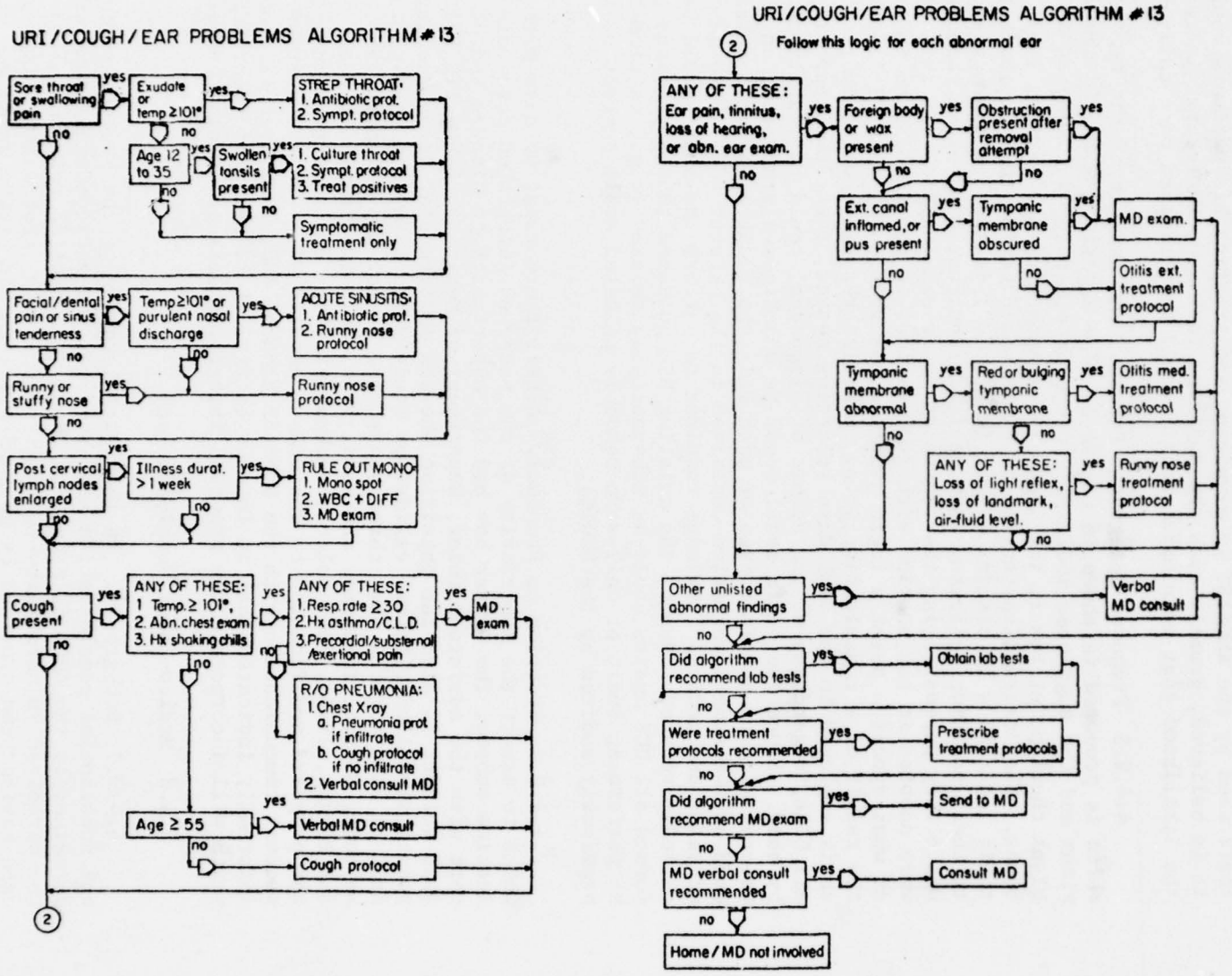
4.4.2.4 Reaction to Proposal. Albeit there exist no data with which to assert the superiority of the proposed integrated data collection scheme, the writer has had the opportunity to discuss the concept with the Assistant Chief, Department of Medicine, BAMC, LTC Wolcott. (LTC Wolcott is also the physician who was instrumental in developing the previously cited clinical validation study which has been ongoing in the AMIC at BAMC for the past three years, see Berger and Wolcott, 1967; Wolcott, Berger, Tompkins, and Wood, 1976; Wolcott, Tompkins, Wood, Sox, and Berger, 1976). Dr. Wolcott enthusiastically endorsed the concept and the proposed modification to the DCSs. Additionally, as a result of subsequent communication with the AMOSIST Branch, AHS, that organization has informally indicated that it intends to field a revision of their DCSs which will incorporate the proposed integrated data collection procedure.

4.4.3 Medico-Legal Considerations.

4.4.3.1 Background. In the initial report of the present series, one substantial consideration addressed was the medico-legal issue as it pertained to the AMOSIST program. Among the specific concerns cited was the perceived vulnerability-to-legal-suit arising from alleged improper care having been provided by an AMOSIST; a vulnerability which was viewed as being particularly acute in view of the relatively inadequate procedures employed by most sites to monitor and audit the extent to which AMOSISTs adhere to the algorithms. Albeit the present findings are in consonance with the observations intially reported, such does not assert

Figure 5

EXAMPLE OF PROPOSED INTEGRATED FUNCTION DATA COLLECTION SHEET



that the AMOSIST Program has, in fact, been a legal liability to the Army Medical Department (AMEDD).

4.4.3.2 Medical Claims. The most appropriate data with which to assess the extent to which the AMOSIST Program has been a medico-legal liability are those depicting the actual incidence with which malpractice claims have been filed against the US Government involving AMOSISTs. While data on this specific issue are in the process of being collected, informal communication with the Department of Legal Medicine, Armed Forces Institute of Pathology AFIP), indicates that the results of these efforts will likely show that very few, if any, such claims have been filed. (The actual findings of this inquiry will be analyzed and reported upon in the brief executive summary which is to appear following the final report in the present series.) Hence, on the basis of informal estimates, it appears that the AMOSIST Program has not, to date, proven itself to have been a medico-legal liability to the AMEDD.

4.4.3.3 Moderating Factor; Severity-of-Illness. Should the actual findings of the AFIP search prove to be as favorable as envisioned, the interpretation should nonetheless reflect the consideration voiced earlier regarding the fact that the illness treated by AMOSISTs should be, for the most part, illnesses which are less severe than those treated by more highly trained care providers. Therefore, it might be argued that the errors made by AMOSISTs are less likely to have a serious, enduring impact upon the recipient of the care than are errors or mistakes made by other care providers who may treat more serious illnesses. While there may exist some merit in such an argument, it is pointed out that claims which are filed involving an AMIC are likely to be those which occur as a result of an error which results in a significant illness. However, given the error rates cited herein, much would seem to depend upon the effectiveness of the triage system in selecting only patients with acute minor illnesses to be seen in the AMIC. If the selection process was poor, then the likelihood that an error would eventuate into a more serious illness would appear to be considerably higher than if the selection process was good. However, the findings of the initial report of this series indicated that the triage process was, if anything, less well monitored and audited than was the treatment DCS function. Hence, the temptation to reintroduce the severity-of-illness issue to explain the findings does not result in as powerful a mitigating factor as might first be thought.

4.4.3.4 Defensibility. While the severity-of-illness issue is one which beclouds several of the comparisons made in the present study, its relevance to the medico-legal aspect of the AMOSIST program differs according to the vantage point taken. As cited above, it is anticipated that the actual assessment of the extent to which claims have, in fact, eventuated from the care which has been provided at AMICs will be very small. This is a different question, however, from that of the legal defensibility of a care provider's actions once a claim has been initiated. Both of these factors, actual incidence of claims filed and the defensibility of same, pertain to the superordinate issue of "vulnerability-to-successful-suit." The present study findings of non-significant

differences in patient return rates between GOCs and AMICs, in conjunction with the anticipated finding that very few, if any, claims have been made against the government which implicate AMIC personnel, suggest that the AMOSIST Program has fared well as regards the frequency-related component of the "vulnerability-to-successful-suit" issue. Nevertheless, the findings of the present report which reflect the AMOSISTs high DCS error rates, and the findings of the initial report which reflect inadequate auditing procedures, suggest that the program is definitely "at (high) risk" as regards the "defensibility-against-suit" component of the issue.

4.4.3.5 Acceptability of Treatment Procedures. Another factor which may be relevant to the medico-legal issue (albeit it is one which is independent of the results of the present study) is that of the validity of the algorithms presently in use outside of BAMC. Even if the present findings regarding DCS error rate had been equal to that evidenced by BAMC AMOSISTs, the procedures themselves would seem to be open to legal question since they have not yet undergone any formal clinical evaluation to attest to their efficacy. While it may be unlikely that the question would be asked, or if asked, that the algorithms would be found wanting, cognizance must be given to the fact that the legal acceptability of a procedure is predicated for the most part upon its acceptance in the medical community. An acceptance of a procedure in the medical community is frequently judged, at least in some substantial part, by its appearance in the professional literature. On this basis, the algorithms appearing in the AMOSIST Manual may be "at risk" since this writer has no knowledge of any formal evaluation of them that has appeared in the professional literature. This vulnerability does not apply to BAMC-validated algorithms, since the results of their evaluations have been published; e.g., Tompkins et al (1977).

5. SUMMARY OF FINDINGS

5.1 Findings Related to Safety of Care Delivered.

5.1.1 Presence of Vital Signs on DCS. The vital signs were found to be relatively infrequently recorded. Among the sample of 282 single diagnosis DCSs completed solely by AMOSISTs, only 60.9 percent had the temperature recorded, none evidenced a pulse rate, 0.7 percent depicted the respiratory rate, and 12.6 percent showed the patient's blood pressure.

5.1.2 Treatment DCS Error Rates. Two hundred eighty two AMOSIST completed DCSs showing one diagnosis and no evidence of a physician consultation were examined to determine to what extent the data recorded therein was in accord with the logic and direction provided in the algorithms. For the purpose of the study, two independent types of errors were identified which correspond to differences reflected on the data entry points of the DCSs themselves. Type A errors were those denoting the presence of a positive (+) entry in data entry points which had been specially marked on the DCS (with an asterisk) to inform the AMOSIST that

if the symptom corresponding to same existed, he must seek a physician consultation prior to completing a treatment plan for a patient. Type B errors were those which denoted the presence of entries to the remaining (non-asterisked) data entry points which were contrary to the logic of the algorithm. These logic-related errors should also have resulted in a consultation with a physician since an AMOSIST is not permitted to assume the entire responsibility for the care of the patient unless that care is in total accord with the algorithm. Both types of error, therefore, reflect errors of omission since both should have resulted in a consultation with a physician--an action which did not occur in the sample of DCSs evaluated. Independently considered, the results of the analysis for Type A errors indicated that a physician's consultation was not rendered as required for 73 percent of the 282 cases evaluated. A separate analysis addressing only Type B errors showed that an even greater proportion, 90.1 percent, of the DCS should have reflected a physician's involvement because of some discrepancy between the algorithm's logic and the AMOSIST's recordings regarding either the symptoms indicated or the treatment plan developed. Considered conjointly, the findings were that nearly all of these 282 DCSs, 97.1 percent, evidenced an error of omission--the lack of a consultation with a physician.

5.2 Findings Related to Medical Effectiveness of Care Delivered (Patient Return Rates). Among the eight general categories of illness addressed by the AMOSISTs algorithms, the overall proportion of AMIC-treated patients who made non-directed returns to obtain additional care for the same or a related illness as had been treated within the clinic within the previous 14 days was not significantly different than that evidenced among GOC-treated patients.

5.3 Additional Findings.

5.3.1 DCS Utilization. Overall, among all 905 DCSs of AMIC-treated patients included in the retrospective record audit, the data were entered upon current DCSs for 83.6 percent of the patients, upon outdated DCSs for 3.2 percent of the patients, and upon SF 600s for the remaining 13.2 percent of the patients.

5.3.2 Frequency of Occurrence Among Diagnoses Rendered. Among all 905 DCSs included in the retrospective audit, nearly 40 percent (20 diagnoses) of the 52 specific diagnoses included in the present AMOSIST Manual occurred two times or less; nine of these did not occur at all.

5.3.3 DCS Format. The format of the DCSs presently in use in the AMOSIST Program does not provide a clear and readily understandable record of the logic employed by AMOSIST in arriving at a diagnosis and determining a treatment plan. Nor do the data recording procedures employed enable AMOSIST physicians performing requested consultations to document the extent and nature of their involvement in the treatment of an AMOSIST's patient.

6. CONCLUSIONS.

6.1 Safety of Care

6.1.1 As a result of the exceptionally high error rate, the AMOSIST program is viewed to be "at risk" from a medico-legal perspective.

6.1.2 The present AMOSIST Manual is overburdened with instruction and logic pertaining to infrequently utilized diagnoses; a condition which is believed to be contributing to the lack of its use by AMOSISTs in the field, and consequently, to the high error rate evidenced.

6.1.3 The validity and efficiency of existing and envisioned treatment DCS auditing procedures is degraded by the lack of use of current, program-prescribed treatment DCSs to record the findings, treatment, and disposition of all AMOSIST-treated patients.

6.1.4 The format of the current data collection sheets and the procedures used by the physicians to record the extent and nature of their impact upon the treatment of an AMOSIST's patient are incompatible with a requirement to efficiently and effectively perform manual audits of treatment DCSs.

6.2 Effectiveness of Care. The AMOSIST Program has the potential to deliver care which is not significantly different in its effectiveness than that which would be delivered by physicians treating a comparable sample of patients.

7. RECOMMENDATIONS.

7.1 Principal Recommendations.

The principal recommendations arising from the present report are that:

a. New series of DCSs and data collection procedures be developed that will clearly depict:

(1) the logic utilized by the AMOSIST in examining and treating their patients, and

(2) the nature and extent of physician impact upon the algorithmic care delivery process which results from AMOSIST-requested physician consultations.

b. HSC develop binding, enforceable guidance for users of the AMOSIST Program that requires daily formal audits to be locally performed and documented and that the results of same (as applies to each AMOSIST) be communicated to each AMOSIST on a daily basis.

c. HSC institute a command quality control program consisting of two basic elements.

(1) The MEDDAC report results of their AMOSIST audit program on a routine basis.

(2) A requirement that each program receive an on site audit of randomly selected records by HSC headquarters personnel as part of routine staff visits and/or the IG visit. This should be done as frequently as practical but as a minimum annually.

7.2 Additional Recommendations. The following actions are recommended for implementation at the appropriate time as determined by the DCSPA, HSC, as part of the AMOSIST Program improvement:

a. That, to the extent possible, the logic employed in each such DCS series be that derived from or to be added in the research efforts ongoing at the BAMC AMIC.

b. That the algorithms and DCSs first revised be those already validated by the BAMC University of Washington (BAMC/UW) Study.

c. That a hierarchy of priorities be developed for the remainder of the algorithms to be addressed, and that this hierarchy be consistent to the extent possible with the sequence in which BAMC/UW intends to address similar algorithms.

d. That any revision of the AMOSIST Manual and associated DCSs reflect the results of an evaluation undertaken to determine the incidence of the diagnoses included in order to increase:

(1) the efficiency and utility of the program, and

(2) the likelihood that the products of the revision are, in fact, employed by the intended users.

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APPENDICES

APPENDIX A
TYPE A ERRORS FOR URI ILLNESSES

A.1 As indicated in the principal text of the report (paragraph 4.2.3.2, page 7) the majority of the AMOSIST-only, single-diagnosis DCSs pertained to URI-related ailments. Since all URI diagnoses appear upon the same DCS (see Figure 1, page 13), it is possible to address these illnesses further. Table A-1 depicts the breakout of all Type A errors encountered among the various URI diagnoses encountered that met the AMOSIST-only, single-diagnoses criteria. In the left hand column of that table are listed all possible Type A errors. According to the instruction provided AMOSISTs, any entry in one of those areas listed should have resulted in a consultation with the supervising physician. The vertical columns within the body of the table reflect the distribution of such errors according to diagnostic category. The extreme right-hand column summarizes the frequency of occurrence of such errors across all diagnostic categories.

A.2 It is apparent, upon examining the summary column, that the vast majority of the Type A errors can be accounted for by only two specific errors: the failures to consult with the physician for instances wherein (a) patients were already taking physician-prescribed medication, and (b) AMOSISTs prescribe medications which were not cited in the AMOSIST Manual. Such errors accounted for 22.5 percent and 43.8%, respectively, of all Type A URI errors. Only one other specific error occurred in more than 10 percent of the DCSs, i.e., that wherein an AMOSIST did not consult the physician concerning an additional subjective patient symptom which he recorded.

Table A-1

Type A Errors for Upper Respiratory Illness Diagnoses

SYMPTOM/CONDITION	DIAGNOSIS (NUMBER OF CASES) *										
	ACUTE OTITIS MEDIA (16)	ACUTE SEROUS OTITIS MEDIA (14)	ACUTE OTITIS EXTERNA (8)	ACUTE SINUSITIS (10)	ALLERGIC RHINITIS (16)	RHINITIS NON-SPECIFIC (9)	ACUTE PHARYNGI-TIS, POS-SIBLY STR-EPTOCOCCAL (17)	ACUTE PHARYNGI-ITIS, NON-SPECIFIC (52)	BRONCH-ITIS (20)	HEADACHE (7)	ALL URI
GENERAL:											
Appears severely ill											
Return visit for unchanged problem	1 (6.3%)	1 (7.1%)		1 (10.0%)							3 (1.8%)
Possibly pregnant	1 (6.3%)	1 (7.1%)		1 (10.0%)						1 (14.2%)	4 (2.4%)
Taking physician ordered medication	8 (50.0%)	3 (21.4%)	2 (25.0%)	2 (20.0%)	5 (31.3%)	1 (11.1%)	1 (5.9%)	10 (19.2%)	5 (25.0%)	2 (14.2%)	38 (22.5%)
Shaking chills											
Fever for more than five days	1 (6.3%)						1 (5.9%)				2 (1.2%)
Rash for less than five days											
EAR:											
Severe Tinnitus											
Severe Vertigo											
Foreign body in ear				3 (30.0%)							3 (1.8%)
Severe mastoid tenderness											
Bloody ear drainage											
Tympanic membrane:											
Retracted	3 (18.8%)										3 (1.8%)
Scarred											
Perforated											
Canal swollen and pointing											
NOSE AND SINUS:											
Nasal drainage actively bleeding											
Facial swelling											
THROAT AND NECK:											
Peritonsillar swelling	1 (6.3%)						3 (17.6%)	6 (11.5%)			10 (5.9%)
Posterior lymph nodes swollen								1 (1.9%)			1 (0.6%)
CHEST:											
Shortness of breath									2 (10.0%)		2 (1.2%)
Non-improving cough											
Purulent/bloody sputum	1 (6.3%)			1 (10.0%)				5 (9.6%)		1 (14.2%)	8 (4.7%)
Unequal breath sounds											
Rales, rhonchi, or wheezes							1 (5.9%)				1 (0.6%)
Chest point tender											
Decrease in neck flexion											
"Other" (i.e., unlisted)											
Subjective symptom			1 (12.5%)	1 (10.0%)	1 (6.3%)	1 (11.1%)	4 (23.5%)		5 (25.0%)		17 (10.1%)
Objective symptom											
TREATMENT/DISPOSITION:											
Temporary profile											
Quarters									1 (5.0%)		
Medication other than AMOSIST Manual	4 (25.0%)	9 (64.3%)	3 (37.5%)	4 (40.0%)	1 (6.3%)	1 (11.1%)	5 (29.4%)	35 (67.3%)	8 (40.0%)	4 (57.1%)	74 (43.8%)
Disposition to hospital ward											
Other (i.e., unlisted) disposition											

* Data within the table are depicted in terms of raw frequency and, in parentheses, in terms of the percent of cases for each diagnosis. Blanks indicate no errors encountered.

APPENDIX B
TYPE B, LOGIC-RELATED ERRORS FOR INDIVIDUAL URI DIAGNOSES: DISCUSSION AND TABLES

B.1 General. Whereas the DCS entries which are relevant to Type A URI errors are reasonably consistent across diagnoses, and are amenable, therefore, to summarization within a single table, such is not the case with Type B URI errors since the logic contingencies which pertain to each DCS entry vary from diagnosis to diagnosis.* As a result, the Type B logic errors which pertain to the URI diagnoses must be depicted separately for each diagnosis. The findings for the most frequently occurring diagnosis, non-specific acute pharyngitis, are shown in Table B-1. (This is done for the remainder of the respiratory diagnoses in Tables B-2 through B-10.) Within the table, the requirements which were not met are cited along with the percentage of cases for which that requirement was not realized in the DCS entries. Entries are grossly divided into two categories, symptom-related entries and treatment-related entries.

B.2 Symptom-related Type B Errors.

B.2.1 The symptom-related, Type B logic errors cited in Table B-1 for Non-specific Pharyngitis example the nature of some of the types of logic errors encountered among the DCSs. The first two cited, "absence of positive throat culture within last 10 days" and "absence of past history of rheumatic fever" provide concrete examples of the second of the two types of "errors of omission" discussed earlier (re paragraph 4.2.3.3.3). All 13 of these errors were due to the absence of any entry in the space corresponding to these conditions. Since they were both, in fact, specifically addressed with the algorithm, there should have existed a negative response entered on the DCS for each item regarding both of these conditions if, in actuality, the patient did lack them.

B.2.2 The other two errors cited provide examples of the remaining principal types of errors encountered. For instance, of the ten errors pertaining to the nature of the chief complaint, three were due to the more usual type of "error of omission," since they reflect the absence of a required positive response. The remaining seven of these ten were errors of commission; i.e., in this instance, the appearance of a chief complaint that was not"sore throat." (The chief complaints in these instances were, however, URI complaints, e.g., "cold," "head cold," "flu.")

*Within the context of the present study, not all positively marked DCS asterisked entries were considered to be Type A errors. Some of the asterisked entries (Figure 1, page 13) are also marked with a "#". Such entries may be addressed specifically within the algorithm for some diagnoses. All asterisked entry errors which were, in fact, directly and specifically addressed within the algorithm were categorized as Type B, logic-related errors rather than Type A errors.

As regards the DCS entry "sore throat for less than 12 days," six of the eight errors encountered were also errors of commission due to the existence of the complaint for a period longer than 12 days prior to the time treatment was sought. The remaining two were errors of omission due to the lack of any indication as to the duration of the symptom.

B.3 Treatment-Related Type B Errors for Non-specific Pharyngitis.

B.3.1 In Table B-1, the preponderance of prescription-related errors are illustrated by the findings for prescriptions for aspirin and acetaminophen as part of the treatment for non-specific pharyngitis. Therein, the findings depicted indicate that for 44.2 percent of the patients, neither aspirin nor its alternate, acetaminophen, were prescribed for 15.4 percent of the patients, acetaminophen was prescribed instead of aspirin without the existence of any entry on the DCS to indicate that the medication-of-choice, aspirin, was contraindicated. In the writer's opinion, however, this latter type of error, the "unauthorized" use of the alternate medication, is less serious than the former since the patient receives at least some medication of the generic type indicated. Nonetheless, from another perspective, that of costs associated with the program, this practice is viewed as an unquestionably undesirable one.

B.3.2 The information appearing in Table B-1 regarding lack of prescriptions for Cepacol Lozenges for 42.3 percent of the patients examples another fairly common practice; i.e., the substitution of another medication not on the DCS for one which already appears therein.* As regards this particular example, it was often the case that Chloroseptic spray (which is not on the DCS or in the algorithm) was apparently prescribed in lieu of (and at other times, in conjunction with) the Cepacol lozenges. (Chloroseptic spray was prescribed for fully 50 percent of the patients with non-specific pharyngitis.) While the outcome or duration of the patient's illness is not likely to be differentially affected by the choice made between Cepacol lozenges or Chloroseptic spray, or the choice made between aspirin and acetaminophen, there does exist at least one reason why the former is the medication-of-choice: its cost. Therefore, while there may be little medical reason for choosing one or the other of these two medications, it is likely that non-adherence to the algorithm's guidance is not cost effective. Comparable information is provided for the remainder of the URI diagnoses evaluated in Tables B-2 through B-10.

*Aside from the apparent non-DCS "substitutions," there were also 17 additional non-DCS prescriptions encountered among the 52 cases addressed in Table 7. They were as follows: Benadril (1), Codeine (1), Darvocet (1), Debrox Otic (1), Percogesic (1), "Snap Caps" (1), Sudafed (3), and Zyambenenyst (8).

Table B-1

LOGIC ERRORS FOR ACUTE PHARYNGITIS, NON-SPECIFIC

REQUIREMENTS	TOTAL NUMBER OF ERRORS	PERCENT OF ALL CASES *
SYMPTOMS		
Absence of positive throat culture within last 10 days	7	13.4
Absence of past history of Rheumatic fever	6	11.5
Chief complaint is "sore throat"	10	19.2
Sore throat for less than 12 days	8	15.4
Treatment		
Aspirin prescribed	23	44.2
Acetaminophen prescribed	8	15.4
Cepacol Lozenges prescribed	22	42.3
Throat culture requested	2	3.8
Disposition to home or duty	4	7.7

* Number of cases is 52. Errors are defined as the absence of required entries (including errors of both commission and omission).

Table B-2

LOGIC ERRORS FOR ACUTE OTITIS MEDIA

REQUIREMENT	TOTAL NUMBER OF ERRORS	PERCENT OF ALL CASES *
Symptoms/Conditions		
Vertigo absent	5	31.3
Decreased hearing present	7	43.8
Earache for less than seven days	7	43.8
Temperature less than 102°F	14	87.5
Non-visibility of tympanic membrane	3	18.8
Tympanic membrane loss of landmarks	10	62.5
Tympanic membrane redness	1	
Treatment		
Instructions to return to clinic	11	68.8
Aspirin prescribed	13	81.3
Actifed prescribed	8	50.0
Dimetapp prescribed	1	6.3
Throat culture requested	1	6.3
Ear culture requested	1	6.3

* Number of cases is 16. Errors are defined as the absence of required entries (including errors of commission or omission).

Table B-3

LOGIC ERRORS FOR ACUTE SEROUS OTITIS MEDIA

REQUIREMENT	TOTAL NUMBER OF ERRORS	PERCENT OF ALL ERRORS *
Symptoms/Conditions		
Vertigo absent	6	42.9
Temperature less than 102°F	13	92.9
Tympanic membrane not visible	4	28.6
Treatment		
Instructions to return to clinic	2	14.3
Actifed prescribed	14	100.0
Disposition to home or duty	1	7.1

* Number of cases is 14. Errors are defined as the absence of required entries (including errors of both commission and omission).

Table B-4

LOGIC ERRORS FOR ACUTE OTITIS EXTERNA

REQUIREMENTS	TOTAL NUMBER OF ERRORS	PERCENT OF ALL CASES *
Symptoms/Conditions		
Vertigo absent	4	50.0
Temperature less than 102°F	1	12.5
Ear drainage white-yellow	4	50.0
Fluid level not observed behind tympanic membrane	2	25.0
Ear canal tenderness	1	12.5
Treatment		
Cortisporin Otic prescribed	3	37.5
Aspirin prescribed	5	62.5
Acetaminophen prescribed	2	25.0
Ear cultures requested	2	25.0

* Number of cases is 8. Errors are defined as the absence of required entries (including errors of commission and omission).

Table B-5

LOGIC ERRORS FOR ACUTE SINUSITIS

REQUIREMENTS	TOTAL NUMBER OF ERRORS	PERCENT OF ALL CASES *
Symptoms/Conditions		
Blood pressure normal	1	10.0
One or both of the following exist: Purulent nasal drainage ** Nasal nucosa swollen and red	4	40.0
Treatment		
Penicillin V prescribed	3	30.0
Aspirin prescribed	4	40.0
Neosynephrine prescribed	6	60.0

* Number of cases is 10. Errors are defined as the absence of required entries (including errors of commission and omission).

** Either subjectively reported or objectively observable.

Table B-6

LOGIC ERRORS FOR ALLERGIC RHINITIS

REQUIREMENTS	TOTAL NUMBER OF ERRORS	PERCENT OF ALL CASES *
Symptoms/Conditions		
Nasal congestion present	2	12.5
Absence of purulent nasal drainage	7	43.8
Nasal nucosa swollen and red	5	31.3
Absence of sinus tenderness	2	12.5
Subjective or objective evidence of watery nasal drainage	6	37.5
At least one of the following: (a) Recurrent/seasonal nasal suggestion (b) Itching eyes/nose (c) Tearing of eyes	3	18.8
Treatment		
Chlorpheniramine Maleate prescribed	10	62.5
Disposition to home or duty	2	12.5

* Number of cases is 16. Errors are defined as the absence of required entries (including errors of commission and omission).

Table B-7

LOGIC ERRORS FOR NON-SPECIFIC RHINITIS

REQUIREMENTS	TOTAL NUMBER OF ERRORS	PERCENT OF ALL CASES *
Symptoms/Conditions		
Runny nose for less than 12 days	4	44.4
Temperature less than 102°F	4	44.4
One or more of the following: **	1	11.1
(a) Recurrent/seasonal nasal drainage		
(b) Itching of eyes/nose		
(c) Tearing of eyes		
Absence of the following in combination: **	1	11.1
(a) Nasal mucosa swollen and red		
(b) Subjective or objective evidence of watery nasal drainage		
Treatment		
Actifed prescribed	3	33.3
Dimetapp prescribed	3	33.3
Disposition to home or duty	3	33.3

* Number of cases is 9. Errors are defined as the absence of required entries (including errors of commission and omission).

** Two logic paths could be utilized to arrive at this diagnosis in accordance with the AMOSIST Manual. Both of the cited multicriteria items required that nasal congestion exist.

Table B-8

LOGIC ERRORS FOR ACUTE PHARYNGITIS,

POSSIBLY STREPTOCOCCAL

REQUIREMENT	TOTAL NUMBER OF ERRORS	PERCENT OF ALL CASES *
Symptoms/Conditions		
Absence of positive throat culture within last 10 days	8	47.0
Sore throat for less than 5 days	2	11.8
Temperature not between 100°F and 102°F	11	64.7
Lymph nodes swollen	2	11.8
Absence of posterior lymph node swelling	15	88.2
Tender anterior lymph node	1	5.9
Treatment		
Aspirin prescribed	10	58.8
Acetominophen prescribed	2	11.8
Cepacol Lozenges prescribed	10	58.8

* Number of cases is 17. Errors are defined as the absence of required entries (including errors of commission or omission).

Table B-9

LOGIC ERRORS FOR BRONCHITIS

REQUIREMENT	TOTAL NUMBER OF ERRORS	PERCENT OF ALL CASES *
Symptoms/Conditions		
Cough less than 12 day duration	2	10.0
Cough more than 12 days and improving	7	35.0
Absence of purulent, bloody sputum	13	65.0
Absence of chest pain	4	20.0
Absence of unequal breath sounds	5	25.0
Absence of rales, ronchi, or wheezing	5	25.0
Treatment		
Robitussin DM prescribed	9	45.0
Dimetapp prescribed	1	5.0
Disposition to home or duty	1	5.0

* Number of cases is 20. Errors are defined as the absence of required entries (including errors of commission or omission).

Table B-10

LOGIC ERRORS FOR HEADACHE

REQUIREMENTS	TOTAL NUMBER OF ERRORS	PERCENT OF ALL CASES *
Symptoms/Conditions		
Headache for less than 2 days	5	71.4
Treatment		
Aspirin prescribed	5	71.4
Acetaminophen prescribed	1	14.3

* Number of cases is 7. Errors are defined as the absence of required entries (including errors of both commission and omission). Additionally, since all of the above data were from data collection sheets evidencing but one diagnosis (and no physician consultation), all 7 of them are incorrect since the logic requires that at least one of eight additional diagnoses be checked.

APPENDIX C
TYPE B, LOGIC-RELATED ERRORS FOR CYSTITIS

C.1 General. As an example of a non-URI illness, the findings pertaining to the only other single diagnosis occurring with any substantial frequency, cystitis, are presented (Table C-1). An additional reason for presenting this finding is the appearance of therapeutic drugs (sulfisoxazole and ampicillin) in the treatment plan.

C.2 Symptom-Related Errors. Two of the symptoms appearing in the table were of the type requiring a negative response. As regards the first and less prevalent error, the absence of vaginal discharge, no response was rendered in one of the five cases while positive responses occurred in the remaining four. Occurring more frequently were errors regarding the requirement that there not exist two or more previous bladder infections. Therein, non-responses accounted for 2 of the 11 errors, while positive responses accounted for 9. Of the two symptoms/conditions requiring positive responses, the failure to evidence criterion-level UA findings was the most frequently encountered error. All 25 of these instances showed negative entries in the relevant spaces. The remaining positive-response-required item, "painful urination for less than 5 days" was found to be an error in 20 (52.6%) of the DCSs. In the majority of the instances, (11 of the 20) they were checked as being negative. Non-responses occurred five times and for the remaining four cases, the length of time indicated exceeded the five day time limit.

C.3 Treatment-Related Type B Errors.

C.3.1 Among the treatment-related requirements for initial visits diagnosed as cystitis is the need to request a urinalysis and culture to be done that same day. As shown in Table C-1, a positive response was not indicated for this DCS entry for 27 of the 38 cases (71.1%). Among these 27, two showed a negative response, 25 evidenced no response at all, and one reflected an ambiguous entry. However, among these 27 it is also noted that nine made some form of entry or written annotation in the upper portion of the DCS (near the UA findings DCS entries) that suggest that a UA had been performed. It is pointed out, however, that if the 27 erroneous DCS entries are reduced by this amount (the eight for which some UA data had, apparently, been obtained), the remaining 19 comprise a very substantial 50 percent of all cases. Hence, even if the data are adjusted, it appears that one-half of the patients diagnosed as having cystitis did not obtain a urinalysis.

C.3.2 The treatment plan cited in the AMOSIST Manual also indicates that the patient is to return 7 days after the completion of treatment (medication for 10 days) and obtain a second urinalysis. At the time of departure from the clinic, the patient is to receive a laboratory slip for his second UA. As shown in Table C-1, these aspects of the treatment plan were largely ignored. The DCS entries indicated that only one of the 38 patients received the correct return instructions (albeit an

Table C-1

LOGIC ERRORS FOR CYSTITIS

REQUIREMENTS	TOTAL NUMBER OF ERRORS	PERCENT OF ALL CASES *
Symptoms/Conditions		
Absence of vaginal discharge	5	12.5
Painful urination for less than 5 days	20	50.0
Absence of two or more previous bladder infections	12	40.0
Obtained or requested urinalyses (UA) with culture	9	22.5
Either (a) UA with more than 20 WBC/hpf or (b) US with 8-20 WBC/hpf and with many bacteria	26	65.0
Treatment		
Ampicillin prescribed	15	37.5
Sulfisox prescribed	22	55.0

* Number of cases is 38. Errors are defined as the absence of required entries (including errors of commission or omission).

additional eight received incorrect return instructions) and only about one-third of the patients received the laboratory slip required to obtain the follow-up UA.

C.3.3 The medications prescribed by AMOSISTs for the treatment of cystitis are shown in Table C-2. As evidenced in the top row, no patient was treated in strict accordance with the algorithm; i.e., given a prescription for sulfisoxazole (or ampicillin) alone. The majority of the patients (35 of 38) received pyridium either as the sole medication (17 patients) or in combination with either sulfisoxazole (8 patients), Septra (1 patient) or ampicillin (7 patients). In consonance with previously cited findings, the alternate drug, ampicillin, was prescribed without apparent documented cause in lieu of the drug-of-choice, sulfisoxazole, in six of the seven cases where it was utilized. While it is not apparent from the table, of the 13 patients for whom the urinalysis (UA) data met one of the criteria for a diagnosis of cystitis, three did not receive either sulfisoxazole, ampicillin, or Septra. Conversely, these drugs were utilized in five instances wherein the UA data did not meet the criteria. The findings which arouse more questions, however, are those portrayed in the bottom two lines of the table. These address prescriptions (or, in one case, the lack of any prescribed medication) for non-therapeutic, symptomatic relief. The questionable portion of the data derives from the observations that (a) only seven of the 20 patients receiving these medications were indicated to have had a urinalysis requested, and (b) 17 of the 20 were reported to have had no UA findings which were indicative of the presence of cystitis. These findings were, nonetheless, evidenced upon DCSs which showed cystitis as the diagnosis--a diagnosis which is predicated upon the existence of specified pathognomonic UA findings. The data are obviously inconsistent. One possible explanation for the lack of pathognomonic UA findings in these instances is that the UAs were, in fact, neither requested nor performed. Albeit this absence would be consistent with the lack of any cystitis-positive, UA findings, such would be contrary to the logic of the algorithm since the algorithm requires the results of a UA to be available prior to making a diagnosis of cystitis. An alternative explanation might be that the UAs were performed and the results, with the exceptions of two cases, were all negative, i.e., for only three cases did the UA measurements meet the cystitis-related criteria employed in the algorithm. For such to have been the case, however, most of the "UA with culture today" entries by the AMOSISTs would have to be incorrect, since 17 of these 20 indicated that no UAs had been requested. Obviously, neither posited "explanation" must have been true for all cases; each may have applied for some portion of the cases in question. Nevertheless, regardless of which circumstance (if any) applied, it remains contrary to the logic of the algorithm for the diagnosis "cystitis" to have been rendered in all but three of the 20 cases appearing in the last three lines of Table C-2.

C.3.4 The last two columns of Table C-2 pertain to the post-treatment UA and culture called for in the treatment of cystitis. Apparently 12 of the 15 patients receiving therapeutic drug treatment received the necessary urine culture and sensitivity laboratory slip required to

Table C-2

MEDICATIONS PRESCRIBED FOR CYSTITIS

DRUGS PRESCRIBED (NO. PTS)	URINALYSIS REQUESTED	UA CRITERIA MET	RETURN INSTRUCTED	FOLLOW-UP URINALYSIS [a]
Sulfisoxazole (0)	-	-	-	-
Sulfisoxazole + Pyridium (3)	8	5	1	7
Septra + Pyridium (1)	1	1	0	1
Ampicillin + Pryidium [c] (7)	6	4	0 [d]	4
Pyridium [e] (19)	5	2	0 [f]	0
Urispas [g] (3)	2	1	0 [h]	1
TOTAL: (38)	23	13	1	13

a. Urine culture requested for 17 days after initiation of treatment.

b. Two other DCSs provided patient return instructions, but both were inaccurate, i.e., one was for PRN and the other was for 14 days instead of 17 days.

c. One of these seven also included a prescription for Parafon Forte. Only one evidenced a contraindication for the "drug-of-choice", Surfisoxazole.

d. Included one instruction for PRN and one instruction without specific number of days cited.

e. One patient also received Darvocef; another received a second drug which was indecipherable on the "Xerox" copy. One also received TCN.

f. Two included PRN instructions.

g. Two of these indicated that they were MD prescribed, but no physician's signature or initials appeared on the DCS.

h. One instruction was PRN.

obtain the follow-up, post-treatment tests. The DCSs for only one of these patients, however, evidenced entries which indicated that they had been appropriately instructed to return. For those receiving only symptomatic medication, the findings are equally poor. None, apparently, received appropriate instructions regarding their return, and only one was provided the necessary laboratory slips for follow-up urinalysis. (It is noted, however, that one could rather obtusely employ a "devil's advocate" position and question the validity of these "errors" by asking if, in fact, it is necessary to either (a) therapeutically treat patients who did not evidence the required UA findings, or (b) instruct them to return for further UAs 17 days later. While this point may be well taken, the question remains why they were diagnosed as having cystitis in the first place.)

APPENDIX D

AMIC RETROSPECTIVE AUDIT

FINDINGS FOR THE URI ALGORITHM

Table D-1

AMIC RETROSPECTIVE AUDIT FINDINGS FOR SINGLE DIAGNOSES FROM THE RESPIRATORY ALGORITHM

DIAGNOSIS	PHYSICIAN CONSULT	FREQUENCY OF OCCURRENCE			NUMBER OF NON-DIRECTED RETURN VISITS			FREQUENCY OF UTILIZATION					
								SF 600			OLD DCSs		
		Site 1	Site 2	Total	Site 1	Site 2	Total	Site 1	Site 2	Total	Site 1	Site 2	Total
Acute Otitis Media (1)	Yes	2	2	4	1	-	1	1	1	2	-	-	-
	No	9	1	10	3	-	3	-	1	1	-	-	-
Acute Serous Otitis Media (2)	Yes	8	6	14	1	-	1	-	3	3	-	1	1
	No	3	2	5	-	-	-	1	-	1	-	-	-
Acute Otitis Externa (5)	Yes	2	3	5	1	-	1	-	3	3	-	-	-
	No	1	5	6	-	1	1	1	1	2	-	1	1
Acute Sinusitis (7)	Yes	1	3	4	1	-	1	-	2	2	-	-	-
	No	5	-	5	-	-	-	1	-	1	-	-	-
Allergic Rhinitis (8)	Yes	4	4	8	-	1	1	2	1	3	-	-	-
	No	8	3	11	1	-	1	-	-	-	-	-	-
Acute Pharyngitis, Possibly Strep (9)	Yes	3	3	6	1	-	1	-	-	-	-	-	-
	No	3	2	5	-	-	-	-	-	-	-	-	-
Strepto-coccal Sore Throat (10)	Yes	-	1	1	-	-	-	-	1	1	-	-	-
	No	-	1	1	-	-	-	-	-	-	-	-	-
Costro-chondritis Non-Specific (11)	Yes	1	1	2	-	-	-	-	-	-	-	-	-
	No	-	-	-	-	-	-	-	-	-	-	-	-
Rhinitis, Non-Specific (12)	Yes	-	-	-	-	-	-	-	-	-	-	-	-
	No	4	1	5	-	-	-	-	-	-	-	-	-
Acute Pharyngitis, N.S. (13)	Yes	6	1	7	-	1	1	1	2	3	-	-	-
	No	16	8	24	-	1	1	-	2	2	-	2	2
Headache, N.S. (14)	Yes	8	1	9	1	-	1	1	-	1	-	-	-
	No	11	-	11	2	-	2	1	-	1	2	-	2
Acute Bronchitis (16)	Yes	7	2	9	-	-	-	-	1	1	-	-	-
	No	10	-	10	-	-	-	-	-	-	-	-	-
Other (0)	Yes	26	11	37	5	4	9	5	7	12	-	2	2
	No	16	3	19	3	-	3	5	1	6	-	-	-
All	Yes	68	37	105	11	6	17	10	20	30	0	3	3
	No	86	25	111	9	2	11	9	5	14	2	3	5
TOTALS:				216			28			44			8

Table D-2

AMIC RETROSPECTIVE AUDIT FINDINGS FOR DCSs HAVING TWO DIAGNOSES FROM THE RESPIRATORY ALGORITHM

DIAGNOSIS	PHYSICIAN CONSULT	FREQUENCY OF OCCURRENCE			NUMBER OF NON-DIRECTED RETURN VISITS			FREQUENCY OF UTILIZATION					
								SF 600			OLD DCSs		
		Site 1	Site 2	Total	Site 1	Site 2	Total	Site 1	Site 2	Total	Site 1	Site 2	Total
1/2	Yes	-	1	1	-	-	-	-	-	-	-	-	-
	No	1	-	1	-	-	-	-	-	-	-	-	-
1/5	Yes	1	1	2	-	1	1	-	-	-	-	-	-
	No	3	1	3	-	-	-	-	-	-	-	-	-
1/7	Yes	2	-	2	-	-	-	-	-	-	-	-	-
	No	-	-	-	-	-	-	-	-	-	-	-	-
1/12	Yes	-	-	-	-	-	-	-	-	-	-	-	-
	No	1	-	1	-	-	-	-	-	-	-	-	-
1/13	Yes	-	-	-	-	-	-	-	-	-	-	-	-
	No	3	1	4	-	-	-	-	-	-	-	-	-
1/14	Yes	-	-	-	-	-	-	-	-	-	-	-	-
	No	1	-	1	-	-	-	-	-	-	-	-	-
1/0	Yes	1	-	1	-	-	-	-	-	-	-	-	-
	No	-	-	-	-	-	-	-	-	-	-	-	-
2/5	Yes	-	1	1	-	-	-	-	-	-	-	-	-
	No	-	-	-	-	-	-	-	-	-	-	-	-
2/7	Yes	1	1	2	-	-	-	-	-	-	-	-	-
	No	-	-	-	-	-	-	-	-	-	-	-	-
2/8	Yes	1	-	1	-	-	-	-	-	-	-	-	-
	No	1	1	2	-	-	-	-	-	-	-	-	-
2/9	Yes	-	-	-	-	-	-	-	-	-	-	-	-
	No	-	1	1	-	-	-	-	-	-	-	-	-
2/13	Yes	-	5	5	-	-	-	-	-	-	-	-	-
	No	4	1	5	1	-	1	-	-	-	-	-	-
2/14	Yes	-	1	1	-	-	-	-	-	-	-	-	-
	No	-	-	-	-	-	-	-	-	-	-	-	-
2/0	Yes	1	-	1	-	-	-	-	-	-	-	-	-
	No	-	-	-	-	-	-	-	-	-	-	-	-
3/13	Yes	-	1	1	-	-	-	-	-	-	-	-	-
	No	-	-	-	-	-	-	-	-	-	-	-	-

(Continued)

Table D-2 cont.

DIAGNOSIS	PHYSICIAN CONSULT	FREQUENCY OF OCCURRENCE			NUMBER OF NON-DIRECTED RETURN VISITS			FREQUENCY OF UTILIZATION					
								SF 600			OLD DCSs		
		Site 1	Site 2	Total	Site 1	Site 2	Total	Site 1	Site 2	Total	Site 1	Site 2	Total
5/6	Yes	-	2	2	-	1	1	-	2	2	-	1	1
	No	-	-	-	-	-	-	-	-	-	-	-	-
5/8	Yes	-	-	-	-	-	-	-	-	-	-	-	-
	No	-	1	1	-	-	-	-	-	-	-	-	-
5/9	Yes	-	2	2	-	-	-	-	-	-	-	-	-
	No	-	-	-	-	-	-	-	-	-	-	-	-
6/8	Yes	-	1	1	-	-	-	-	-	-	-	-	-
	No	-	-	-	-	-	-	-	-	-	-	-	-
6/0	Yes	-	1	1	-	-	-	-	-	-	-	-	-
	No	-	-	-	-	-	-	-	-	-	-	-	-
7/9	Yes	-	1	1	-	-	-	-	-	-	-	-	-
	No	-	-	-	-	-	-	-	-	-	-	-	-
7/13	Yes	3	-	3	1	-	1	-	-	-	-	-	-
	No	1	-	1	-	-	-	-	-	-	-	-	-
7/16	Yes	-	1	1	-	-	-	-	-	-	-	-	-
	No	-	-	-	-	-	-	-	-	-	-	-	-
8/13	Yes	-	1	1	-	-	-	-	-	-	-	-	-
	No	2	-	2	1	-	1	-	-	-	-	-	-
8/14	Yes	1	-	1	-	-	-	-	-	-	-	-	-
	No	-	-	-	-	-	-	-	-	-	-	-	-
8/16	Yes	1	-	1	-	-	-	-	-	-	-	-	-
	No	1	-	1	-	-	-	-	-	-	-	-	-
9/14	Yes	-	1	1	-	-	-	-	-	-	-	-	-
	No	-	-	-	-	-	-	-	-	-	-	-	-
9/16	Yes	1	-	1	-	-	-	-	-	-	-	-	-
	No	1	-	1	1	-	1	-	-	-	-	-	-
9/0	Yes	-	1	1	-	-	-	-	-	-	-	-	-
	No	1	-	1	1	-	1	-	-	-	-	-	-
10/10	Yes	-	1	1	-	1	-	-	1	1	-	-	-
	No	-	-	-	1	-	1	-	-	-	-	-	-

(Continued)

Table D-2 cont.

DIAGNOSIS	PHYSICIAN CONSULT	FREQUENCY OF OCCURRENCE			NUMBER OF NON-DIRECTED RETURN VISITS			FREQUENCY OF UTILIZATION					
								SF 600			OLD DCSs		
		Site 1	Site 2	Total	Site 1	Site 2	Total	Site 1	Site 2	Total	Site 1	Site 2	Total
11/0	Yes	1	-	1	1	-	1	-	-	-	-	-	-
	No	-	-	-	-	-	-	-	-	-	-	-	-
11/16	Yes	-	-	-	-	-	-	-	-	-	-	-	-
	No	-	1	1	-	-	-	-	-	-	-	-	-
12/13	Yes	1	5	6	-	-	-	-	2	2	-	-	-
	No	1	7	8	-	2	2	-	-	-	-	-	-
12/14	Yes	-	-	-	-	-	-	-	-	-	-	-	-
	No	-	1	1	-	-	-	-	-	-	-	-	-
12/16	Yes	-	2	2	-	1	1	-	-	-	-	-	-
	No	-	-	-	-	-	-	-	-	-	-	-	-
12/0	Yes	-	-	-	-	-	-	-	-	-	-	-	-
	No	1	-	1	1	-	1	-	-	-	-	-	-
13/14	Yes	-	1	1	-	-	-	-	-	-	-	-	-
	No	1	3	4	1	-	1	-	-	-	-	-	-
13/15	Yes	-	1	1	-	-	-	-	-	-	-	-	-
	No	-	-	-	-	-	-	-	-	-	-	-	-
13/16	Yes	1	1	2	-	-	-	-	-	-	-	-	-
	No	2	-	2	-	-	-	-	-	-	-	-	-
13/0	Yes	2	1	3	-	1	1	-	1	1	-	-	-
	No	1	-	1	-	-	-	-	-	-	-	-	-
14/0	Yes	-	-	-	-	-	-	-	-	-	-	-	-
	No	2	-	2	1	-	1	-	-	-	-	-	-
15/16	Yes	-	-	-	-	-	-	-	-	-	-	-	-
	No	1	-	1	-	-	-	-	-	-	-	-	-
15/0	Yes	-	1	1	-	-	-	-	-	-	-	-	-
	No	1	-	1	-	-	-	-	-	-	-	-	-
16/0	Yes	-	1	1	-	-	-	-	-	-	-	-	-
	No	1	-	1	-	-	-	-	-	-	-	-	-
All	Yes	18	36	54	2	5	7	0	6	6	0	1	1
	No	31	17	48	7	2	9	0	0	0	0	0	0
TOTALS:				102			16			6			1

Table D-3

AMIC RETROSPECTIVE AUDIT FINDINGS FOR DCSs HAVING MORE THAN TWO DIAGNOSES FROM THE RESPIRATORY ALGORITHM

DIAGNOSIS	PHYSICIAN CONSULT	FREQUENCY OF OCCURRENCE			NUMBER OF NON-DIRECTED RETURN VISITS			FREQUENCY OF UTILIZATION					
								SF 600			OLD DCSs		
		Site 1	Site 2	Total	Site 1	Site 2	Total	Site 1	Site 2	Total	Site 1	Site 2	Total
3 DXs	Yes	15	31	46	1	4	5	-	5	5	-	2	2
	No	13	22	45	1	3	4	-	-	-	-	-	-
4 DXs	Yes	3	22	25	-	1	1	-	1	1	-	1	1
	No	2	8	10	-	-	-	-	-	-	-	-	-
5,6 DXs	Yes	2	2	4	-	1	1	-	1	1	-	1	1
	No	-	2	2	-	-	-	-	-	-	-	-	-
All ≥ DX	Yes	20	55	75	1	6	7	7	0	7	0	4	4
	No	15	32	57	1	3	4	0	0	0	0	0	0
TOTALS:				132			11			7			4

APPENDIX E
EVALUATORY COMMENTS REGARDING THE OVERLAY TRANSPARENCY APPROACH TO THE AUDITING OF TREATMENT DATA COLLECTION SHEETS

E.1 General. The following paragraphs present a brief critique of the overlay transparency method of auditing treatment DCSs. Discussed are the issues of DCS sample constraints, time requirements, and overlay construction.

E.2 DCS Selection and Availability.

E.2.1 One of the principal drawbacks of the proffered overlay approach to a large-scale audit of AMOSIST-completed DCSs is the limited number of DCSs to which it might be applicable. The initial constraint is that audits are applicable only to DCSs completed without the need for physician consultation. As depicted in Table E-1 it is clear that nearly two-thirds of all DCSs are apt to be excluded from the logic-related audit on these grounds alone. If the audit is performed solely upon DCSs evidencing but a single diagnosis, the number available for audit purposes is decreased to but one-fourth of all AMOSIST-completed DCSs. While it may appear that the sample of auditable DCSs could be significantly increased by relaxing the "single diagnosis" constraint employed in the present study and include two-diagnosis DCSs as well, the present data suggest that such is not the case. The criterion employed in the present study was that at least five DCSs had to exist to justify the effort entailed in developing an overlay transparency. Were the same criterion to be utilized in the two-diagnosis situation, it is readily apparent that only the URI category of illness could be addressed since there does not even exist a total of five two-diagnosis DCSs in any of the other categories, let alone a unique combination of two for which five existed. Unfortunately, the subsample of 48 two-diagnois URI DCSs (Table E-1) provided only two combinations (Acute Pharynsitis in conjunction with Acute Serous Otitis Media and Acute Pharyngitis in conjunction with non-specific Rhinitis) which occurred five or more times. In sum, were the sample of AMOSIST-only completed DCSs expanded to include two-diagnosis DCSs, the number of evaluable DCSs would have been increased by less than five percent.

E.2.2 While the above discussion began with an assertion that the small number of records available constituted a drawback to the "overlay" approach, the use of the term "drawback" to describe the circumstance was rhetorical since it is in actuality a limiting condition (rather than an adverse one) which applies not only to the manual overlay approach but also to any DCS logic auditing procedure employed using the present DCSs. As pointed out previously, a deficit inherent in the present system of data collection is that there is no way to determine whether or not an AMOSIST's consultation with a physician resulted in a decision to overrule the logic of the algorithm. Thus, for any auditing process used with the present DCSs (be it manual or computerized) only about one-fourth of all DCSs would be aduitable. (The single-diagnosis constraint remains, however, a limitation of an overlay auditing approach using the present type of DCS. As

Table E-1

DISTRIBUTION OF RETROSPECTIVE AUDIT SAMPLE: AMOSIST-TREATED CASES BY ALGORITHM, NUMBER OF DIAGNOSES PER DCS, AND PHYSICIAN CONSULTATION REQUIREMENTS

ALGORITHM	PHYSICIAN CONSULTED	TOTAL NO. PTS	SINGLE DIAGNOSES NO.	% OF TOTAL	TWO DIAGNOSES NO.	% OF TOTAL	THREE OR MORE DIAGNOSES NO.	% OF TOTAL
Eye (1)	YES	14	12	85.8	2	14.2	-	-
	NO	7	5	71.4	2	28.6	-	-
Respiratory (2)	YES	234	105	44.9	54	23.1	75	32.0
	NO	216	111	51.4	48	22.2	57	26.4
Gastrointestinal (3)	YES	44	43	97.7	1	2.3	-	-
	NO	20	20	100.0	-	-	-	-
Genitourinary (4)	YES	69	56	81.2	13	18.8	-	-
	NO	35	33	94.4	2	5.6	-	-
Musculo-Skeletal, Spine (5)	YES	6	6	100.0	-	-	-	-
	NO	1	1	100.0	-	-	-	-
Musculo-Skeletal, Extremity (6)	YES	63	63	100.0	-	-	-	-
	NO	21	21	100.0	-	-	-	-
Skin-Regional (7)	YES	73	69	94.5	4	5.5	-	-
	NO	15	14	93.3	1	6.7	-	-
Skin-General (8)	YES	56	54	96.4	2	3.6	-	-
	NO	31	31	100.0	-	-	-	-
All (1-8)	YES	559	408	73.1	76	13.5	75	13.4
	NO	346	236	68.2	53	15.3	57	16.5
TOTALS		905	644	71.1	129	14.3	132	14.6

will be discussed later, however, this limitation might be avoided if the format of the DCSs were changed.)

E.3 Time Considerations. Another consideration related to the use of an overlay auditing process is the amount of time necessary to retain the medical records for the purpose of evaluating them or extracting the required information from them. It is likely that an overlay approach would permit a daily audit to be made of 100 percent of all single diagnosis, AMOSIST-completed DCSs (DCSs which reflect no physician consultation) at a cost of approximately one man-hour per day with no need to retain the medical records within the AMIC for any amount of time beyond the end of normal workday once the auditor becomes familiar with the use of the overlays and properly schedules his time. (The one man-hour estimation is based upon a workload of 100 patients per day from which, as described earlier, only 25 would be legitimate candidates for logic-related audit.)

E.4 Overlay Transparency Construction. One difficulty encountered in the present study that should be addressed if a decision were to be made to develop and export an overlay evaluation system is that of the site-to-site distortions in the DCSs, due apparently, to differences among the various copiers and printers employed to effect local reproduction of the DCS originals first supplied by AHS. It is noted, however, that centrally distributed DCSs would eliminate the problem of distortion-induced overlay mismatch. Albeit budget allocations might have to be redistributed to permit AHS to effect the centralized printing and distribution of all forms required, it may be that quantity discounts from vendors would permit this function to be performed at little overall increase in cost to the command.*

*(Presently, each hospital must locally reproduce all DCSs.) Were all overlay transparencies to be centrally produced and distributed from AHS, the recipients would have to suffer the continuing minor irritation of having to adjust the overlays two, three, or more times for each DCS evaluated in order to keep them properly aligned.

9. DISTRIBUTION:

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HQDA (DASG-HCC) (5)

Dir, Joint Medical Library, Offices of the Surgeons General, USA/USAF
The Pentagon, RM 1B-473, Washington, DC 20310 (1)

HQ USAF/SGHX Forrestal Bldg., Space 6H 034, Washington, DC 20314 (1)

Dir, Health Care Administration Division (Code 72), 23rd & E Streets,
NW, BUMED, USN, Department of Navy, Washington, DC 20372 (1)

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